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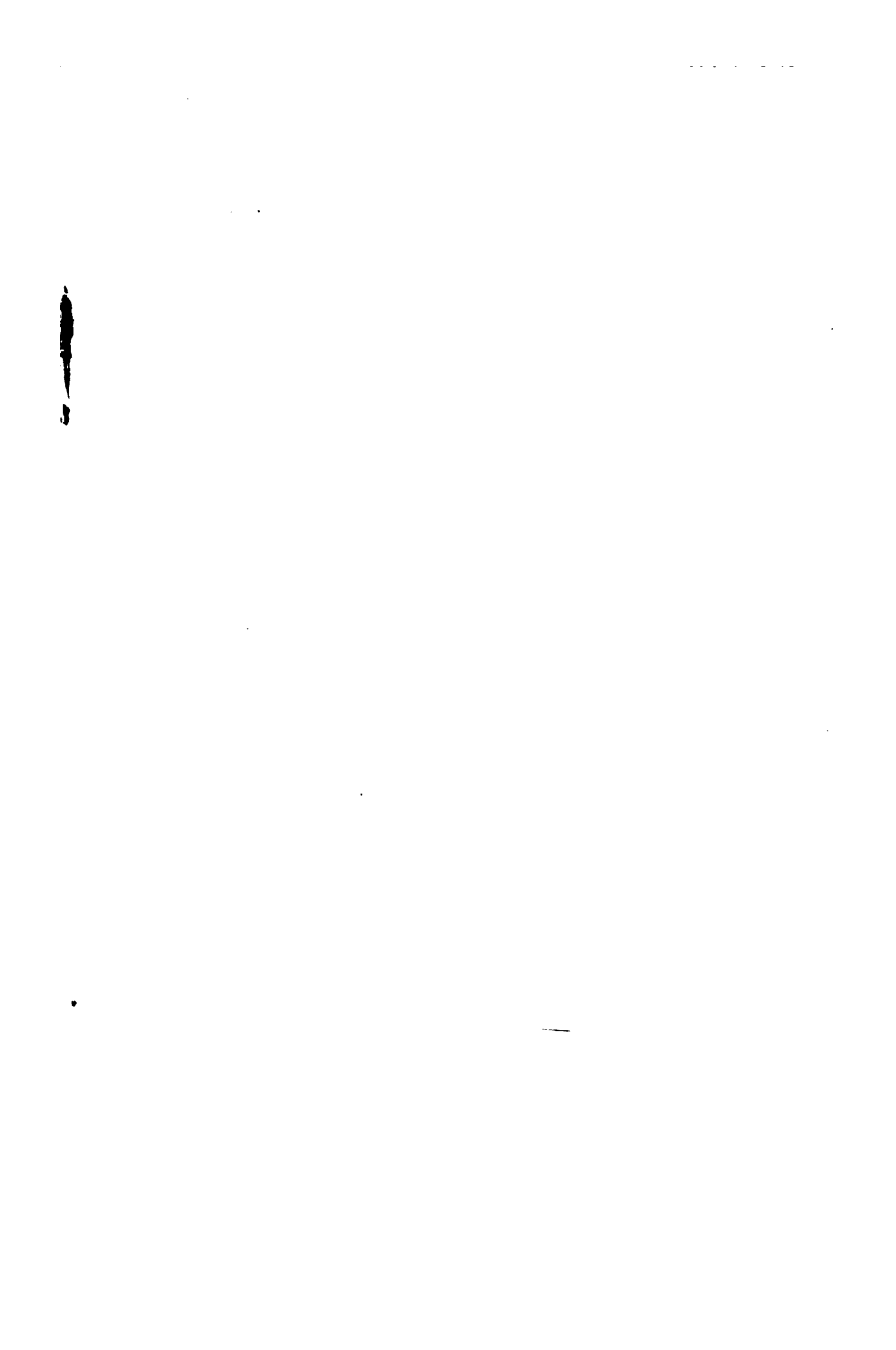
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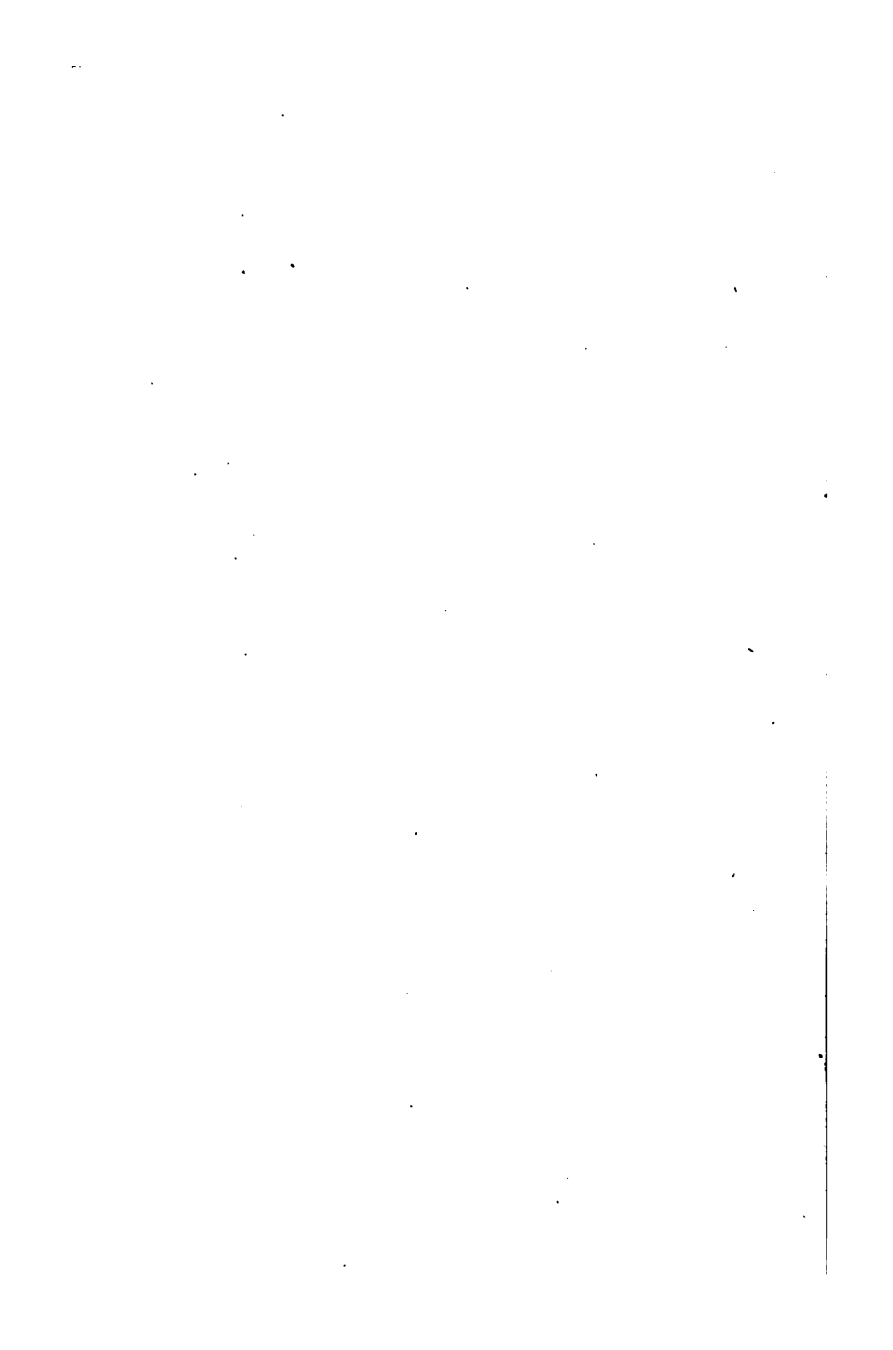
THE
DENTAL STUDENT'S
NOTE BOOK

OAKLEY COLES.

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EDITED BY
OAKLEY COLES.

LONDON:
GEORGE BUTCHER, 4 CRANE-COURT,
FLEET-STREET.



—
1876.

160. g. 81.

List of Authorities referred to in compiling

THE DENTAL STUDENT'S NOTE BOOK.

ANNANDALE.—Abstract Principles of Surgery.

BEALE.—Structure of the Elementary Tissues.

Bioplasma.

DRUITT.—Surgeon's Vade Mecum.

ERICHSEN.—Science and Art of Surgery.

GREEN.—Pathology and Morbid Anatomy.

HEATH.—Injuries and Diseases of the Jaws.

Minor Surgery and Bandaging.

HOLMES.—System of Surgery.

HOOPER.—Physician's Vade Mecum.

OWEN.—Odontography.

PAGET.—Surgical Pathology.

SALTER.—Dental Pathology and Surgery.

TANNER.—Principles and Practice of Medicine.

TOMES.—Dental Surgery.

TOMES, C. S.—Lectures on Dental Surgery.

WEDL.—Pathology of the Teeth.

WEST.—Diseases of Infancy and Childhood.

PREFACE.

At the request of many of my former pupils these Notes are now published. They were originally prepared for my class, and simply printed in slips for private use. The name of the book indicates at once its character and its object.

I have given elsewhere a list of those authors to whom I am indebted for information contained either in their published works or private manuscripts. I make no pretence to authorship in connection with this volume. I have simply collected from many sources that which I found useful to my pupils, and in publishing these Notes act only as an Editor of other men's writings and investigations.

I must especially thank my friend Mr. Gaddes for the very great assistance he has rendered me in seeing these sheets through the press, having previously given me most highly-valued aid in compiling fresh material and extending the scope of the original notes with a view to increasing their utility.

5 Upper Wimpole-street,
June 21st, 1876.

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DEVELOPMENT.

Development of Teeth.

THE GENESIS OF THE HUMAN TEETH, in the embryo, commences about the end of the second month. The margins of the jaw exhibit a slight longitudinal furrow with rounded borders, termed the "dental groove" (not to be confounded with the dental groove of older authors). This groove is filled with oral epithelium, so that it is not distinguishable on the surface, but can be seen in transverse section. At the bottom dips down a simple process of epithelium into the sub-mucous tissue. At this stage it is one continuous process all round the jaw, and it is not yet divided into portions for the several teeth. A dark area is seen at the bottom of this process in the sub-mucous tissue; the area is due to increased nutrition of the part, appearing only in those positions where teeth are subsequently to be found. This area of opacity, which eventually rises up into papillæ, becomes the "**DENTINE GERM**," the inflection of epithelium becoming the "**ENAMEL ORGAN**." When, at a later period, the connection of the

enamel organ with the oral epithelium is cut off, the rudiments of the tooth are enclosed in a sort of capsule by tissue continuous with the base of the dentine papilla; this capsule is called the "**DENTAL SAC**," and at a later period its inner surface forms the **CEMENTUM**.

THE ENAMEL GERMS OF THE PERMANENT TEETH are budded off from the necks of the enamel organs of the corresponding temporary teeth; that of the six-year-old molar starts *de novo* from the oral epithelium, the second from the first, and the third from the second.

Development of Enamel.

THE FIRST SIGN OF ENAMEL development is a mere dipping down of the oral epithelium. The epithelium of the dental groove, with the exception of the deepest layer, consists of large spherical cells, the cells of the deepest layer (*Rete Malpighi*) being columnar, and is immediately continuous with the similarly formed cells situated at the periphery of the enamel germ. At some points the enamel germ seems to descend perpendicularly from the base of the dental groove; but in other regions, especially in the neighbourhood of the incisors, it extends obliquely towards the

median line. Soon the cells forming the enamel germ begin to increase rapidly, so that the germ becomes conically elongated, like a club, which is continuous by a narrow neck with the oral epithelium. At the same time the **DENTINE GERM** increases in a contrary direction, and projects upwards into the base of the enamel germ, so that the latter crowns the former like a cap. The connection between the several portions of the enamel germ then becomes broken, so that a special division corresponds to each of the dentinal germs. Each enamel organ is thus composed of a sort of cap surmounting the dentine germ, and a narrow cord of cells extending to the oral epithelium, and called the "*neck of the enamel organ*." The cells of the deepest layer elongate rapidly, and form very regular six-sided prismatic bodies. External to these columnar cells are a number of rounded cells, called the "*stratum intermedium*," and those cells which fill up the centre break up into a sort of stellate tissue, while the cells upon the border remain much as before, and form the "*external epithelium*."

Thus, from the dentine outwards we have—

- 1st. Internal epithelium, or columnar cells.
- 2nd. Stratum intermedium.

3rd. Stellate tissue.

4th. External epithelium.

The 1st *forms* the enamel; the 2nd recruits the internal epithelium and thus eventually forms enamel; the 3rd only acts for a time, to fill up the space, and disappears; and the 4th dwindles and has no function (Tomes). By some it is said to eventually form *Nasmyth's membrane*.

THE ENAMEL BECOMES CALCIFIED from within outward. Calcareous matter is first deposited at the periphery of the enamel cells, the central part being the last to calcify. Thus the enamel which is first formed is perforated, as it gets older the perforations get smaller, till they finally disappear.

Development of Dentine.

The upward growth in the sub-mucous tissue which meets the inflection of oral epithelium is **THE GERM OF THE DENTINE**. The dentine germ consists of fine connective tissue, of cells containing nuclei, and of blood-vessels which ramify and freely anastomose. At a more perfect stage of development nerve fibrils are also found. The cells upon the surface of the papilla elongate and assume a

columnar form—odontoblasts. **THE PAPILLA** grows up and assumes roughly the form of the apex of the future tooth. **THE LAYER OF ODONTOBLASTS** upon the surface is termed the *membrana eboris*.

THE ODONTOBLASTS have three sets of processes—the lateral, which serve as a connecting link between each other; a pulp process, which serves as a connecting link with those of a deeper layer; and a dentinal process which runs into the dentinal tubes. The lateral processes are possibly produced by the preparation of the specimen. **ODONTOBLASTS CALCIFY** from without inwards, their central portions remaining soft and unaltered as the *dental fibrils*, forming the so-called dentine processes of odontoblasts; the "*dentinal sheaths*," so named by Neumann, lie between the soft fibril and the fully calcified matrix.

If the thin edge of a forming cap of dentine be examined it will have the appearance of being made up of globules of varying size. The calcareous matter is, in the first place, deposited in the matrix in the form of globules; these increase in size, and ultimately coalesce, their outlines being obliterated by the deposition of calcareous salts in their interstices.

The nerves in the dentine germ are found later than the vessels. DENTINE calcifies from without inwards.

Development of Cementum.

When the dentinal papilla is growing into the form of the future tooth, and is invested as by a cap by the enamel organ, a process (in section appearing as two processes) grows up from the base of the dentinal papilla, and invests the rudiment of the tooth. This upward growth separates the oral epithelium from the enamel organ, cutting, as it were, right through the neck of the latter. It is called the "*dental sacculus*," and furnishes the cementum and periosteum. The inner surface of this sac is, after a time, covered with osteoblasts or bone-cells. The osteoblasts calcify from without inwards, being fused together by calcification of their exteriors. Sometimes calcification, instead of steadily progressing and filling up the centre of the cells, proceeds irregularly, and leaves tracks of uncalcified matrix: thus a lacuna and canaliculi are formed. The *lacuna* is really uncalcified matrix or formed material. Just as calcification may fail to fully obliterate the osteoblasts, so it may fail to obliterate the

external contours of clusters of them, thus forming "ENCAPSULED LACUNÆ."

CEMENT calcifies from within outwards.

Direction of Calcification in the Tissues.

ENAMEL calcifies from within outwards.
Columnar cells from without inwards.

DENTINE from without inwards. Odontoblasts from without inwards.

CEMENTUM from within outwards. Osteoblasts from without inwards.

Periods of Development.

EMBRYONIC PERIODS.

7th week	...	Inflection of Epithelium.
10th "	...	Different organs formed.
15th "	...	Permanent enamel organ formed from neck of temporary enamel organ; also that of 1st permanent Molar.
16th "	...	Dental sac of temporary teeth completed, enclosing dentine papilla, surmounted by enamel organ.

17th week	...	Dentine germ of first permanent Molar.
17th „	...	Cap of dentine formed, calcification of enamel cells following.
20th „	...	Dentine germs of permanent Incisors, Canines, and Bicuspid.
23rd to 25th, 6th month	...	Calcification commences in formative organs of first permanent Molar.

ABOUT NINTH MONTH

OF FETAL LIFE Completion of the sacs of ten anterior permanent teeth.

AT BIRTH	...	Incisors and Canines begin to calcify.
3 MONTHS	...	Enamel organ of second permanent Molar.
1 YEAR	...	Dentine germ of second Molar appears.
3 YEARS	...	Enamel organ of wisdom-teeth.
6 YEARS	...	Dentine germ of wisdom-teeth.

Development of Jaws.

THE LOWER JAW consists of two distinct lateral halves, which unite at about the first year. The jaw has a horizontal portion or body, and two perpendicular portions or rami.

THE BODY is divided into alveolar and basilar portions; the former, which is subservient to the development of the teeth, is above the inferior dental canal; the latter, which supports muscles of mastication and deglutition, is below that line. Ossification commences in each lateral half at the sixth week of intra-utérine life; development steadily progresses until maturity in the basilar part, nearly its full depth being attained by the seventh year, after which it remains comparatively unchanged. The early development of the alveolar part is in excess of the basilar, to afford protection for the calcifying temporary teeth. This having been accomplished, the process is then interrupted by periods of partial absorption for the eruption of the teeth.

EACH ASCENDING RAMUS is divided into condyloid and coronoid processes. The development backwards of the horizontal portion is accomplished by a rough deposition of osseous tissue

upon the anterior and posterior borders of the rami, the formation of bone being greater upon the posterior border, whilst absorption is greater on the anterior. Thus, by a continued process of rough plastering and modelling by absorption the prolongation backwards is accomplished; the external oblique line, indicates the backward movement of the coronoid process, and the internal oblique line, or mylohyoid ridge, that of the condyloid process. The elongation of the articular processes is brought about by development in cartilage beneath the articular cartilage.

By the prolongation of the horizontal portion in a semi-elliptical direction, by a deposition of osseous substance upon the external surface, and not by an interstitial growth, is the external arc of the jaw increased. The widening of the jaw in correspondence with the increasing width of the base of the skull takes place behind the alveolar arch in the ascending portion, and is affected by the process of absorption on the inner, and addition to the outer surface of the part. Development in the fibro-cellular tissue at the symphysis is limited to intra-uterine life. Backward growth takes place in three positions. 1. In the subarticular cartilage of the condyle. 2. In the periosteum

investing the coronoid process. 3. In that investing the angle.

The same general principles pertain to the development of the **UPPER JAW**. The lengthening of the alveolar process is effected by a deposition of bone at the tuberosity. The tuberosity thus bears the same relation to the upper as the base of the coronoid process does to the lower jaw. The upper jaw is said to have four centres of ossification. The antrum commences development at about the fourth month of foetal life, the process beginning by absorption of the bone and formed material, probably in a similar manner to the formation of medullary cavities and of air bones in birds. At birth it is represented by a depression on the outer wall of the nasal cavity.

*Development of the Alveolar Processes
in connection with First and Second
Dentition.*

IN FIRST DENTITION the alveolar processes are formed after the dentine papillæ are developed, and at birth have risen up to the level of the developing teeth. Within two or three months they arch over and nearly enclose the teeth. When they are ready for eruption the anterior

wall of each alveolus is absorbed to about one half its whole depth. The tooth comes through a roomy aperture, and after its emergence the alveolus closes around the neck, developing with the tooth as it elongates. **WHEN THE PERMANENT TEETH** are ready to emerge, the process of absorption is again called into requisition, and the labial wall of each alveolus is, in the anterior part of the jaws, removed down to the neck of the emerging tooth. As each tooth lengthens the alveolar development strictly conforms to the position taken.

Changes in the Angle of the Rami.

AT BIRTH the angle is obtuse. With the separation of the jaws, by the development of the teeth and alveolar border, the angle becomes less obtuse, till, in the adult jaw, the rami assume nearly a right angle with the body.

Through the loss of the teeth, and consequent absorption of the alveolar border, as in **OLD AGE**, the angle again becomes obtuse. In consequence of that loss the muscles have less work to do, and the jaw diminishes in bulk accordingly.

THE ANGLE, then, is subservient to the presence of teeth (natural or artificial): remove these, and to effect the meeting of the jaws the angle must, necessarily, be less acute to permit the mental process to pass through a greater distance with the same amount of movement of the joint.

STRUCTURE.

Structure of Enamel.

ENAMEL is the hardest of all the tissues of the body, and contains from 1-3 per cent. of animal matter in the adult tooth, but as much as 15 per cent. in the soft enamel of young teeth; the animal matter is contained inside the prisms. The earthy matter consists of phosphate of lime, with traces of fluoride of calcium, carbonate of lime, phosphate of magnesia, and other salts.

Enamel is of a clear bluish colour, and at the neck of the tooth is somewhat overlapped by the cementum. Adult enamel is of a fibrous nature, composed of fibres running parallel with one another, and at right angles to surface of dentine, no intervening substance being demonstrable. The inner extremities of the fibres rest upon, and are united to, the surface of the dentine; their outer ends form the surface of the tooth. The fibres appear to be solid, and in their passage from the dentine pursue a waved, or, according to Hannover, a spiral course. *Examined microscopically* in transverse section the fibres

appear hexagonal in form : this probably is due to their close pressure together. There are also seen in examining the fibres appearances known as the "decussation of the fibres." This is owing to the thickness of the specimen examined, several layers being included in the section. Enamel fibres are marked by transverse lines, or striæ; this striation does not necessarily coincide in contiguous fibres. The striæ are best seen in dark yellow-coloured enamel. What they are due to is a very doubtful question. *Waldeyer* says they are due to the decussation of the fibres, while *Hertz* accounts for their presence by the assumption of intermittent calcification. By the action of chromic acid the inside of the prisms is seen to differ slightly from the outside; probably there is more organic matter in the former. Sometimes a diminution in the fibrous nature of the enamel is seen at the surface and terminal edge; this diminution is restricted, however, in fully-formed enamel, to the terminal edge. Enamel does not become quite hard and matured until some time after the tooth is cut.

Structure of Dentine.

DENTINE is a yellowish white, highly elastic substance, which, when broken, has a silk-like

appearance. It is composed of a matrix and fine branching fibres, which occupy fine tubes, the "*dental tubuli*." Dentine consists of 28 parts of animal and 72 parts of earthy matter. The animal matter is resolvable by boiling into gelatine. The earthy matter consists of phosphate of lime, carbonate of lime, and traces of fluoride of calcium, phosphate of magnesia, and other salts.

The inner ends of the tubes, together with the matrix, form the boundary of the pulp cavity, their outer extremities forming the surface of the dentine. The tubes in their course make several bold primary curves, like the italic letter *f*, lines of Shreger; these occur especially in the crown, and in a less degree in the fang. Numerous branches are given off from the tubes; these branches are comparatively few in the crown until they arrive at the surface of the dentine. In the fang they are numerous, and become more so as they approach the surface of the tissue. The tubes become connected together by the anastomosis of their branches, and establish communication with the external dental tissues. They terminate in the crown by forming cusps, or become too minute to be traced, and occasionally pass into the enamel

and become lost. In the neck of the tooth the branches anastomose freely, and are lost near the surface of the tissue; near the neck they stop short of the cementum, but near the end of the root they not uncommonly pass into the cementum and connect themselves with the lacunæ. In marsupials the extension of the dentinal tubes into the enamel and cementum is remarkably characteristic of that order. The tubes contain soft fibrils, prolongations of the tooth pulp, the **DENTINAL FIBRILS** of Tomes,—and can be easily stained with carmine. Mr. Salter doubts the existence of the fibrils, and considers that the tubes contain fluid. This much disputed question as to the nature of the contents of the dentinal tubes appears to hinge, not so much upon the intra-tubular substance, as upon the term given to the axis of the tube by different writers. Tomes says it is a soft homogeneous fibril. Salter, that it is “dense plasma,” “viscid contents.” These differences can be reconciled in the theory of Beale, who terms the contents of the dentinal tubes bioplasm—primary matter, in consistence like “clear gum or syrup.”

Thus, then, the matrix, tube sheath, and tube contents, are bioplasm in three stages of development.

The walls of the tubes are called the "**DENTINAL SHEATHS**" of Neumann, and resist the action of acids more than any other part of the tooth. Neumann considers them to be calcified; Waldeyer thinks that the fibrils become atrophied in their peripheral portions in advanced age, and ultimately the canals become obliterated. Beale says: "A narrow portion of the matrix extending outwards from each mass of bioplasm still remains permeable, and the process of calcification proceeds so much more slowly in this portion than in the rest of the matrix that the dentine produced refracts differently, and is harder in texture."

The definition of the **DENTINAL SHEATHS** may be briefly stated as the contents of the odontoblasts which have undergone chemical change prior to calcification; bioplasm in that transitional condition being most resistant to the action of re-agents. The tubes are largest at the pulp cavity, and become smaller as they approach the periphery. The matrix in a perfectly-formed tooth ought to be structureless. Another structure in the dentine, rapidly acted upon when attacked by caries, is the "*interglobular spaces*." They are situated in greatest number on the surface of the dentine

of the root, forming the granular layer of Tomes. When seen on that part of the dentine covered with enamel they are indicative of faulty development; so also is a granular form of the dentine with which these interglobular spaces are generally associated. But an interglobular space may be found in any part of the dentine.

In a dry tooth they are empty spaces, their contour corresponding to segments of spherical masses of calcified formed material. In a fresh tooth they contain soft dentinal matter—"formed material"—and only differ from the surrounding tissue in calcification. Their mode of formation is probably somewhat analogous to the formation of lacunæ in bone.

The dentinal tubes pass across an interglobular space without interruption.

The coronal dentinal tubes generally become lost in the granular layer, those of the root passing on to the cementum.

Dentine is often found in a **GLOBULAR FORM** in semi-detached masses adherent to the surface of the pulp cavity, and also in perfectly detached masses in the substance of the

pulp itself. They are found abundantly in caries. Some think them the result of disease.

A granular condition of the tubes in the peripheral portion of the root of a tooth is perfectly normal, but not so when occurring in the crown. Dentine, which lies immediately beneath the enamel, is more sensitive than that which lies deeper.

"**AREOLAR DENTINE**" consists of dentine in which interglobular spaces have existed, but later on their contents have become calcified, leaving just a faint outline of segments of circles.

"**VASO-DENTINE**"—not normal in man—is that in which remnants of the pulp remain uncalcified; with this is generally found "*vitro-dentine*." The canals may be simple or complex. In some types the structure may be likened unto a number of teeth cemented together, as in the rostral teeth of the saw-fish (*Pristis*).

"**OSTEO-DENTINE**" is almost undistinguishable from bone, and is vaso-dentine with lacunæ. Such is the character of the dentine produced by intrinsic calcification of the pulp.

Structure of the Cementum.

CEMENTUM is very similar to bone in structure. The structure depends on the amount of tissue present. When it is in a very thin layer it appears quite clear and structureless; when, however, it attains thickness, it is found to contain lacunal cells and canaliculi, which in the dry specimen appear as black spots with processes. They are never arranged in distinct Haversian systems, but only something like it; and when cementum is thick it is laid on in lamellated layers. Encapsuled lacunæ are also found. They may be isolated by prolonged steeping in acid, and sometimes three or four lacunæ are packed into one capsule. You may sometimes isolate canals from the cementum. Lacunæ and canaliculi contain uncalcified material—bioplasm—the remnant of an osteoblast. In bone that has been for some time removed from the body these spaces are empty, only containing air, which is supposed to be carbonic acid gas. As a rule, there are no Haversian canals in cementum; they are, however, found in exceptional cases. The lacunæ are more scattered, and the canaliculi are very numerous.

Membrana Preformativa.

This membrane does not really exist at all, but is only the result of reagents. Mr. Huxley considered it to be situated between the enamel pulp and the enamel, so that all development took place beneath this membrane. It is found to be a membrane full of holes, and contains enamel cells. As cells of enamel calcify from without inwards, the perforations are due to only partial calcification—bioplasm having undergone chemical change prior to calcification. Thus the *membrana preformativa* is nothing more than the youngest layer of enamel.

Henle considers it exists between the enamel and the dentine, the former being calcified outwards from it and the latter inwards.

Others say it is situated between the pulp and the dentine.

Nasmyth's Membrane.

This is really a membrane which exists upon the surface of the enamel. It is also called "enamel cuticle," "persistent tooth capsule," or "cuticula dentis." By the action of acids it can be peeled off the crown

of the tooth. With nitric acid, which stains it yellow, it can be traced right round from the crown to the fang.

In depressions of bicuspid and molars you often find a thick layer of membrane, which is generally opaque and brown. This thick layer contains "encapsuled lacunæ," such as you find in thick layers of cementum. It is generally considered to be a rudimentary form of cementum, not having all the characters of that tissue on account of its thinness. It is unchanged by maceration in water, or by boiling in strong acetic, hydrochloric, sulphuric, or nitric acid.

The Pulp.

In an old tooth the pulp cavity almost disappears. The adult pulp is composed of fine connective tissue, cells with nuclei, granules of Purkinje, vessels, and nerves. The external layer of cells is more specialised: if you tear away the pulp, you leave the external layer attached to the dentine. This is named the "*membrana eboris*;" it is composed of cells called "*odontoblasts*," which are much larger than the rest, and branched. If some of it be picked to pieces you get cells with large

nuclei and four processes; one which runs into the dentinal tube—this is known as the *dentine process*—the one at the other end is the *pulp process*, the others the *lateral processes*, which unite with the next odontoblasts. The nucleus is always near the pulp end. Nerves form a plexus in the expanded portion of the pulp, and break up into non-medullated nerve-fibres and form loops near the “*membrana eboris*,” but they are easily destroyed, and thus difficult to demonstrate. They have never been seen to enter the dentinal tubes. The blood vessels are very abundant and largest in the centre. They ramify and anastomose freely, the capillary loops form a rich network beneath the odontoblasts.

The Periosteum.

The lining membrane of the alveoli connecting the teeth with the jaw has been described as consisting of two forms of membrane—periosteum and peridental membrane. But Tomes asserts it is but one tissue, and that the white fibrous tissue runs uninterruptedly through the whole thickness. The periosteum is developed from the outer layer of the dental sac, and envelopes the fang of the

tooth; at the neck it shades into the gums, and at the apex on to the nerves and blood-vessels which enter the foramen. It is different from other periosteum in the absence of elastic tissue and fat cells. It is supplied by the nerve and blood-vessels which supply the tooth pulp, and thus there is a close connection between the two. It also receives a vascular supply through the vessels which supply the gum, and from those of the contiguous alveoli. The fibres at the neck have been described as the "*ligamentu circulare dentis*." In old age the periosteum becomes very thin. Nothing is known of the lymphatics of the pulp and periosteum.

The Gum.

The gum consists of dense fibrous tissue connected with the periosteum, covered by mucous membrane bearing squamous epithelium. Upon the surface the mucous membrane is prolonged into finger-shaped papillæ. Blood vessels are numerous. It is not very sensitive.

COMPARATIVE ANATOMY OF THE TEETH.

TEETH OF VERTEBRATA are dermal, not epidermic appendages.

Bills of Birds and Chelonian Reptiles, baleen of Cetacea, and horny teeth of ornithorhynchus and lampreys, are epidermic and are not homologous with the true teeth.

TRUE TEETH are developed on papillæ of the mucous membrane, which are usually enclosed in a dental sac. In Mammalia only is there a distinct deciduous set succeeded by a permanent set.

TRUE TEETH ARE ENTIRELY ABSENT in most of the Edentata, in some adult Cetacea, and monotremata among Mammalia. In all Birds, Chelonian reptiles, cyclostome fishes, and Amphioxus.

In the embryo Balcenidæ among Cetacea minute teeth are developed, to be replaced in the adult by "baleen" plates (whalebone).

STRUCTURE.—Some of the teeth of fishes consist only of dentine.

In fishes, also, modifications of dentine, "vitro-dentine," "osteo-dentine," &c., help to form the teeth.

In Mammalia, and generally in Reptiles, the teeth are composed as in man of dentine, enamel, and cement. These substances may be arranged as in man, a cap of enamel covering the dentine at the crown, the fang being coated with a layer of cement, or they may be arranged in vertical folds, so disposed as to present a permanent rough surface due to the different degrees of hardness of the three materials. Considerable variation exists in the direction of these folds. The molars of the Herbivorous mammalia chiefly present this character.

THE NUMBER OF TEETH when present varies extremely, *e.g.*, 2 in the narwhal, 100 to 190 in the dolphins, and in many fishes they amount to several hundreds or even thousands.

IN MAMMALIA the teeth are carried only in the superior and inter-maxillaries and lower jaw. In the Ruminantia there are no teeth in the inter-maxillaries. In the narwhal the teeth are limited to the inter-maxillaries. In the cachalot (a variety of whale) there are only teeth in the lower jaw.

IN CROCODYLIAN REPTILES the teeth are confined to the superior maxillaries, inter-maxillaries, and dental part of the lower jaw. In Saurian and Ophidian reptiles the teeth may be developed in these bones, and also in the pterygoid and palate bones. The poison teeth of venomous snakes are carried by the superior maxillary bones.

IN AMPHIBIA teeth are carried on the superior maxillaries, inter-maxillaries, dental part of lower jaw and vomer, and occasionally on the pterygoid and palatine bones.

IN FISHES teeth may be carried on the superior (rarely) and inter-maxillaries, dental part of lower jaw, pharyngeal, palatine and nasal bones, vomer, base of occipital, and hyoid bones and brachial arches.

IN MAMMALIA only are the teeth distinguishable into incisors, canines, and molars, and not in all the orders of that class. In some existing primates only is there no diastema, as in man.

THE INCISORS (carried above in the inter-maxillary bones) may be present in both jaws as in primates, cheiroptera, insectivora, rodentia, carnivora, phocidæ, and ungulata except rumi-

nantia. Absent in both jaws in most of the edentata, adult manatee. Absent in upper jaw only in horned ruminantia. Absent in lower jaw only in trichecus, elephas and adult dugong.

THE CROWNS OF THE INCISOR TEETH usually present a transverse cutting edge, as in man, sometimes more distinctly chisel-shaped, as in rodents. The number varies, as—primates $\frac{4}{4}$, carnivora, $\frac{6}{6}$, rodentia $\frac{2}{2}$, $\frac{0}{2}$ horned ruminants.

THE CANINES.—Never more than one on each side above and below, and all four present in primates, cheiroptera, insectivora, carnivora; some ungulata, as horse, tapir, pig, hippopotamus; horned ruminantia; carnivorous, and insectivorous marsupialia. Canine teeth are wanting in both jaws in rodentia, proboscidea, sirenia, and most of the edentata. Present in upper jaw only in trichecus and herbivorous marsupials, and in lower jaw only in some hornless ruminants.

THE CANINE TEETH always have a single-pointed crown, which may be of same height as crown of incisors, or shorter (some insectivora) or longer (carnivora, &c.). They may be

very largely developed, forming the tusks of the walrus.

THE MOLAR TEETH entirely absent only in cetacea and some edentata. When they occur they are present in both jaws.

NUMBER very variable, but rarely more than

$$\begin{array}{r} 4 \ 4 \\ \hline 4 \ 4 \end{array}$$

SHAPE of the crown very variable; broad and carrying 2, 3, 4 blunt cusps, omnivorous as in man and other primates.

Cusps may be sharp and pointed as in some insectivorous and frugivorous primates, cheiroptera, insectivora, and marsupialia. The crown may be brought to a cutting edge parallel in direction to the jaw, and this edge may be thrown into several lancet-shaped (carnivorous) or spine-shaped (piscivorous) eminences. In herbivorous mammals the crowns of the molar teeth are broad and flattened, the surface being kept roughened by the arrangement of the constituents of the teeth in ridges, which, for the most part, are arranged *across* the crowns.

The fangs of the mammalian opposable teeth present two main modifications.

In some the fangs taper to a point as in man, the aperture at the apex being gradually

occluded and the nutrition of the teeth stopped, with the result that the teeth reach a certain size and remain so. In the other variety, as the incisors of rodents, canines of the boar, molars of many herbivora, &c., the fangs are not smaller, and may be even larger at their ends than at the cervix, forming a covering for the pulp, which in such cases is said to be persistent; the teeth, unless being worn away by attrition with their fellows, continuing to grow to a considerable length with the age of the animal.

Except in some of the delphinidæ among the cetacea, the teeth in those mammals which possess them are opposable, are lodged in alveoli, and are more or less masticatory in function.

In some of the delphinidæ (porpoise, dolphin), in Saurian and Ophidian reptiles, in Amphibia, and in Fishes, the teeth are alternate and prehensile in function, and similar in shape.

The **PREHENSILE** teeth are usually the most numerous. They are embedded in sockets in the jaw in the delphinidæ and crocodilia, and in almost all other cases are fangless, being

attached to the bones which carry them by bone or ligament.

The crowns of such teeth are usually conical and somewhat incurved, offering but little resistance to the passage of solids into the mouth, but obstructing the return. Occasionally the crowns are triangular and flattened, with serrated edges, as in many sharks; and in some of the phytophagous and mollusc-feeding fish the crowns are broad and cuboid, with the flattened surfaces rough, for crushing marine plants and shells.

THE POISON TEETH OF SERPENTS are folded on themselves, so as to form a more or less complete canal along their anterior convex border, which communicates above with the poison gland, and at the point of the tooth is open.

The loosely attached prehensile teeth are easily torn off, and these are usually replaced from behind. Whilst the masticatory teeth of most mammalia are replaced in a vertical direction; the teeth in crocodilia succeed each other in a similar manner, the new tooth being developed on a papilla which grows upwards into the pulp cavity of the previous tooth, which it eventually dislodges.

TEETHING.

Eruption of Teeth.

Primary :

7th month	...	central incisors.
7th to 10th	„	... lateral incisors.
12th „ 14th	„	... anterior molars.
14th „ 20th	„	... canine.
18th „ 36th	„	... posterior molars.

Molars. Canines. Incisors. Canines. Molars.

Months.	24 12	18	9 7 7 9	18	12 24
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Permanent :

(Teeth of lower jaw usually precede those of upper jaw by a short interval.)

6½ years	...	1st molars.
7	„	... central incisors.
8	„	... lateral incisors.
9	„	... 1st bicuspid.
10	„	... 2nd bicuspid.
11-12	„	... canine.
12-13	„	... 2nd molars.
17-25	„	... wisdom teeth.

FORMULÆ.

$$\begin{array}{rcl}
 & \text{Mo. Ca. In. Ca. Mo.} & \\
 \text{Temporary} & \text{Upper } 2 \quad 1 \quad 4 \quad 1 \quad 2 = 10 & \\
 \text{Teeth.} & \text{Lower } 2 \quad 1 \quad 4 \quad 1 \quad 2 = 10 & \\
 & & = 20
 \end{array}$$

$$\begin{array}{rcl}
 & \text{Mo. Bi. Ca. In. Ca. Bi. Mo.} & \\
 \text{Permanent} & \text{Upper } 3 \quad 2 \quad 1 \quad 4 \quad 1 \quad 2 \quad 3 = 16 & \\
 \text{Teeth.} & \text{Lower } 3 \quad 2 \quad 1 \quad 4 \quad 1 \quad 2 \quad 3 = 16 & \\
 & & = 32
 \end{array}$$

TABLE FOR CALCULATING AGE FROM DEVELOPMENT OF TEETH.

Age in Years.	Incisors.		Canine.	Bicuspsids.		Molars.		
	Cen.	Lat.		1st.	2nd.	1st.	2nd.	3rd.
7	...	...	...	...	...	4	...	...
8	4	...	...	...	...	4	...	...
9	4	4	...	...	...	4	...	...
10	4	4	...	4	...	4	...	...
11	4	4	...	4	4	4	...	...
12-12½	4	4	4	4	4	4	...	...
12½-14	4	4	4	4	4	4	4	...
18-25	4	4	4	4	4	4	4	4

Symptoms of Teething.

Always an increased flow of saliva, and at times a child cuts its teeth without any other symptom; but this is exceptional. The mouth generally becomes hot, the gums tumid, tense, and shining, and the tooth is marked by a prominence of the gum. At times there is great heat and intense redness of the mucous

membrane, the saliva being very abundant, with aphthous ulceration of the tongue and sides of the lips. Either of these states is attended, generally, with feverish disturbance, and the infant cries and is peevish. A third morbid condition is at times seen, generally ushered in with considerable fever, gums extremely hot, swollen, and tender, in the form of a small tumour over the tooth being cut. Small unhealthy ulcers form over the surface of the gum. This affection is very painful, and is called "*odontitis infantum*." Diarrhoea nearly always accompanies teething, the attacks occurring when the different groups of teeth are being cut. Rickets interferes greatly with the eruption of the teeth.

FULL-GROWN FÆTUS.—Union of the two halves, both of the upper and lower jaws, is effected by the interposition of cartilage. The inferior dental foramen is situated between the angle of the jaw and the edges of the inner wall of the alveolus of the first permanent molar. The mental foramen is situated at the point corresponding to the septum which divides the sockets of the temporary canine and the first temporary molar, and on a plane with the bottom of the alveoli. The tem-

porary teeth are partly formed, the *central incisors* are calcified through the greater part of their crown. *Laterals* less advanced. *Canines* are calcified at their terminal points only. *Molars* imperfectly calcified at the masticating surfaces. The inferior dental canal is seen at the bottom of the alveoli for the first or second temporary molars.

TWO MONTHS.—In the *upper* jaw but little change ; it is a little larger, and the sockets are deeper. Growth takes place also a little at the median line, and the teeth converge to prevent separation. In the *lower* jaw the changes are more marked, the angle is less obtuse, the articular process is more prominent ; thus in early infant life growth is most active in the ascending ramus. The teeth are not much advanced in the second month.

NINTH MONTH.—The alveoli in the front of the mouth become absorbed, the sockets of the molars become separated from the floor of the orbit by the antrum, the sockets for the first permanent molars are not perfected.

TWELVE MONTHS.—Osseous union of the two halves of the jaws. Incisors through in both jaws ; the molars also nearly showing.

FORTY MONTHS.—All the temporary teeth are in the normal position, but the fangs are incomplete, those of the incisors only being completely formed. The angle is more acute. The first permanent molar is internal to the anterior surface of the coronoid process.

FOUR YEARS AND ONE MONTH.—Large crypts for the second permanent molar.

AT 4 YEARS primary dentition is complete.

Absorption of the Temporary Teeth.

The part lying nearest to the growing tooth is generally absorbed first, although absorption may have commenced at several and distinct points, sometimes on the labial surface of the root. The cementum is first attacked, then the dentine disappears, and if absorption is carried to a great extent the enamel also suffers. Whichever of the tissues is attacked, appearances are seen the same as when bone is undergoing absorption—namely, a surface full of deep indentations with semi-circular outlines. Closely applied to this surface is a cellular mass which is but slightly adherent. By the aid of the microscope, this mass is seen on its surface to be made up of

peculiar multi-form cells, each one being composed of several smaller ones. Thus, the individual cavities in the absorbed tissue are seen to be filled with one of these cells. The cells are called "osteoclasts," and the small excavations, "lacunæ of Howship." It is this mass of cells that performs the office of absorption, and *absorption is not caused by pressure of the permanent tooth*, as was generally believed. Absorption at times takes place at a remote distance from the growing tooth—viz., on the labial surface;—also a layer of bone is, at times, found dividing the socket of the temporary tooth from the crypt of the former; thus these two facts considerably shake the theory that absorption is produced by pressure of the permanent tooth. Another reason is that the first teeth remain in their place to the exclusion of the second teeth, which are kept in the substance of the jaw, or appear out of position. When once the office of absorption commences it does not necessarily go on, but at times is suspended, and development takes place in the form of cementum in the excavated surfaces. Thus after a time, absorption, in *these cases*, preponderates over development, and the tooth is lost.

*Relation of the Temporary Teeth to the
developing Permanent Teeth, when
the former are fully formed.*

The position of the temporary teeth differs from that of the permanent set in being perfectly vertical. The crown of each tooth is placed over or under (as the case may be) its own root, the latter standing immediately in front of the succeeding tooth. At this period the permanent teeth are contained in bony cells. On removal of the bone from the anterior surface of the maxilla, it will be seen that the *permanent central incisors* are placed nearly parallel with each other, the cutting edges of the upper teeth being inclined a little forwards, the parts corresponding to the base of the crowns of the teeth being placed immediately below the floor of the nose, and separated by a thin layer of bone. The lower incisors (central) have a strictly vertical position, but are more advanced in development than the upper centrals.

THE LATERAL INCISORS have a slightly oblique direction in the upper jaw; the side of the lateral, which, in the perfected teeth, lies against the canine, here rests against the

cell containing the first bicuspid, while the canine is above the latter tooth. In the lower jaws the laterals are placed less regularly, holding a position slightly more backward than the centrals; the teeth are turned from the median line, and lie obliquely over the canine to the extent of about half the tooth. They do not, as in the upper jaw, come in contact with the cells containing the first bicuspid.

THE PERMANENT CANINES are situated above the line of the other teeth in the upper jaw, and below in the inferior maxilla. In the upper jaw they are directed slightly forwards and outwards; while in the lower jaw they have a direction upwards and inwards.

THE BICUSPIDS are placed in cells situated between the roots of the temporary molars.

If the permanent teeth were placed vertically in the jaws like their predecessors, there would be no room in the upper jaw for the canines. The upper incisors have an oblique direction forwards and outwards, while the vertical line is, at this age, followed by the bicuspid; thus there is sufficient room between the other teeth for the canine to take its place.

PATHOLOGY AND SURGERY.

Inflammation.

INFLAMMATION (*inflammo*, to set on fire).—**SYMPTOMS.**—Local and Constitutional.

LOCAL.—Redness and swelling, with heat and pain.

REDNESS, mainly due to increased quantity of blood in part; hence, if pressed upon, it disappears, to quickly return. Tint varies with activity of process—if active, bright red; if more chronic, dark red, and livid.

SWELLING, due partly to increased vascularity, partly to proliferation of existing tissues, and partly to migration and subsequent proliferation of the colourless corpuscles of the blood, and to a considerable extent to the transudation of *the fluid contents of the vessels*. A rigid organ like a tooth does not swell, although its contained pulp is infiltrated with fluid and corpuscular material.

HEAT, due to increased flow of blood of a higher temperature. The focus of inflammation is hotter than the arterial blood going to it.

PAIN, due to disorganisation of nerve-supplied tissue, and stretching and compression of nerve-fibrils. Pain is proportionate to the intensity rather than the extent of inflammation, and is especially great in unyielding tissues, as bone and fascia.

CONSTITUTIONAL symptoms may precede or follow the local, according to the cause.

Abstracted blood becomes "buffed" and "cupped."

Inflammatory Fever, or Pyrexia, which may be sthenic, asthenic, or irritative.

The urine excreted is below the normal amount.

The process of inflammation is as follows:—
On irritation there occurs—

1. **ACCELERATION** of blood-stream and dilatation of blood-vessels. Active hyperæmia (arterial).
2. **RETARDATION** of blood-stream, passive hyperæmia or congestion (venous).
3. **STASIS OR STAGNATION**. As the blood-stream becomes slower and slower, the colourless corpuscles adhere to the sides of the vessels, and to each other, thus blocking up the former.

4. **EXUDATION** of *liquor sanguinis* and of the *colourless corpuscles of the blood* (leucocytes), which undergo proliferation, or increase, by division. The coloured corpuscles also pass through the walls of the capillaries to some extent.
5. **ALTERATION** in the nutrition of the inflamed tissue, resulting in increased cell formation, due to increased nutritive activity from the exudation of *liquor sanguinis*.

Inflammation may be **ACUTE** or **CHRONIC**. In acute inflammation the cause has been severe, and its duration usually short. The resulting changes in the tissues are correspondingly rapid.

The more acute the inflammation, the more rapid the formation of pus, and destruction of the tissues.

Chronic inflammation differs from the acute form in the cause being less severe, and the duration of its action extending over a longer period. The phenomena are less intense and more prolonged than in acute.

Acute inflammation may *terminate* by—

1. **RESOLUTION**.—Absorption of the exuded

substances. The walls of the vessels recover their tonicity and the part regains its normal condition.

2. METASTASIS.

3. BECOMING CHRONIC.

- 4. SUPPURATION.** The formation of pus - cells from the leucocytes—white blood corpuscles, lymph corpuscles, connective tissue corpuscles. These pus-cells are suspended in a liquid, *liquor puris*. Pus-cells have the power of absorbing or causing the destruction of the tissues with which they come in contact. Pus then consists of pus-cells, liquor puris, and the debris of the tissues. Suppuration may be diffuse or circumscribed.

- 5. DEATH** of the part (ulceration, gangrene, caries, necrosis).

CAUSES OF INFLAMMATION.

EXCITING.

1. Mechanical and chemical irritation.
2. Action of cold.
3. Morbid poison.

LOCAL PREDISPOSING.

1. Over-stimulation.
2. Previous inflammation.
3. Tendency to local congestion.

CONSTITUTIONAL PREDISPOSING.

1. Over-stimulation of vascular and nervous systems.
2. Depression of vascular and nervous systems.

PRINCIPLES OF TREATMENT.

1. To relieve the part from causes of excitement (removal of cause).
2. To depress the local action, and to obviate its hurtful consequences—
 - (a) By depressants and sedatives, as cold and opium, applied externally or internally.
 - (b) By stimulants or derivatives, to cause counter-irritation or derivation.
 - (c) By general depletion.
 - (d) Febrifuge treatment, other than depletion.
 - (e) By incision, to relieve vascular tension; pressure to promote emptying of vessels.
 - (f) Cauterisation, to break continuity of morbid process.
 - (g) Antiseptics, local or general.
 - (h) Surgical operation, for discharge of inflammatory collections, removal of gangrenous parts, or of parts rendered irreparable or dangerous to life.

- (i) Narcotics, to promote cessation of exhausting pain.
- (k) Use of specific drugs, to counteract specific dyscrasial conditions.
- (l) Use of mercury, to develop such a constitutional condition as will resist the formation, or cause the destruction, of false membranes and adhesions.
- (m) On the subsidence of inflammation, to promote a healthy action of the part by attention to general health and by local stimulation.

Dental Caries.

DEFINITION.—"A softening and disintegration of the tooth's surface, gradually penetrating towards its centre." (Salter.)

CAUSES.—"That it is due to the solvent action of acids which have been generated by fermentation going on in the mouth, the buccal mucus, probably, having no small share in the matter; and when once the disintegrating process is established at some congenitally defective point, the accumulation of food and secretions in the cavity will intensify the mischief by furnishing fresh supplies of acid." (Tomes.) Thus the causes may be considered

as *exciting* and *predisposing*. Among the conditions which would be included under the latter head may be mentioned structural defects; pregnancy; hereditary predisposition; those systemic conditions in which nutrition is interfered with, and the secretions perverted, as fever, dyspepsia, stomatitis, &c.

The disease, having penetrated the enamel, progresses more rapidly through the dentine; disintegration taking place in the matrix in the direction of the dentinal tubes, the sheaths of which are the last to be destroyed.

The *translucent zone*, which is invariably present in the dentine between the caries and the pulp, may be explained according to two theories—"The tissue might be rendered more transparent either by the obliteration of the canals by calcification of their contents, or by the decalcification of the matrix, which, by lowering its refractive index, would bring it more nearly into accord with that of the air contained in the tubes." (Tomes.)

The obliteration of the dentinal tubes by calcareous deposit is a symptom, but not a sign—a character, but not a characteristic—of vital action, inasmuch as the condition takes place in a dead tooth as well as in a living one.

Another condition frequently found in carious dentine is varicosity and globular swelling of the tubes.

Leptothrix buccalis and other cryptogamous growths are constantly present in carious dentine. The fungoid growth is to be found upon the surface and within the tubes; and it is supposed to be a cause of the varicosities, and also of caries, though probably it has no share in the origin of the disease.

Diseases of the Pulp.

IRRITATION OF THE PULP.—A diseased condition of the pulp, whatever may be the nature of the disease, is, in the majority of instances, consequent upon the pulp cavity being laid open, either by caries or mechanical violence. *The causes* may be exposure of the dentinal fibrils; direct transmission to the pulp of thermal changes, as through a metallic filling upon sensitive dentine; exposure of pulp; osteo-dentinal bodies; and it may arise from systemic causes. Irritation of the pulp is followed by a hyperæmic condition of the organ. This may lead to the formation of secondary dentine, or to acute inflammation of the pulp.

SYMPTOMS.—Tooth painful (pain of a boring character), and highly sensitive to hot and cold temperature; painful in mastication and on pressure.

TREATMENT.—In simple caries resort to plugging. If the patient cannot bear the introduction of a permanent plug, fill with a temporary one—*e.g.*, gutta percha. For the sensitiveness of the dentine in preparing the cavity; arg. nit. in back teeth (on account of dark colour produced), chloroform, creosote, camphorated spirits of wine, &c. &c. For sensitive dentine round necks of teeth, caustic good. Constitutional treatment when indicated.

Acute Inflammation of the Pulp.

In ninety-nine cases out of a hundred the diseased action is the result of perforation of the pulp cavity. It may be a result of irritation. The pulp being exposed, food and other irritants collect in the cavity, causing considerable uneasiness, the removal of the food producing comfort; but as this goes on, in course of time the pain, instead of leaving off, increases, assumes a throbbing character, becomes still more acute, and extends from the

faulty tooth to the neighbouring teeth and to the side of the face, the tooth forming the centre of its intensity. The larger and younger the pulp, the greater the pain. After some hours the pain usually subsides, to return again on the slightest provocation, or on the patient resuming the horizontal position. Often the pulp dies after one, two, or three attacks of throbbing pain. On the death of the pulp the pain does not necessarily subside, but will be changed in character, being dull, heavy, and with a feeling of tension. The tooth feels too long and raised in its socket, by inflammation of the dental periosteum, leading to alveolar abscess. After a while the abscess bursts, the pain subsides, and the elongation and tenderness gradually pass off. A phosphatic odour is given off from the pulp cavity.

TREATMENT.—When there is reason to think the pulp has not suffered much destruction, endeavour to save it by exposing thoroughly, and treat with carbolic. Then cap with a non-conductor, and fill. If the pulp has been destroyed down into the root, remove the remnant after devitalising, treat root canal with antiseptic, and fill. Treat

periostitis, when present, with iodine and aconite. Where the operation is objected to, the pain can be mitigated by poppy-head fomentations, &c.

Chronic Inflammation of the Pulp.

Chronic inflammation of the pulp may arise independently of caries or mechanical injury, but is nearly always due to an opening into the pulp cavity.

SYMPTOMS.—Pain less severe than in the acute form, and neither long in duration nor very intense when present. It generally comes on at irregular intervals; often wandering, neuralgic pains. A sudden change of temperature, application of irritants, such as salt or sugar, will generally bring on a paroxysm of pain, which may last for a few minutes, or for hours. The pulp at the exposed point is of a deep red colour, very sensitive, and bleeds readily when touched. If the tooth is removed and the pulp cavity opened, it will be found that the inflammation has been limited to the spot exposed, the rest being pale and healthy. In the acute form the pulp throughout would be injected with blood, the exposed part being deeper in colour.

The following are the consequences of chronic inflammation of the pulp:—

1st. The change in the character of the exposed pulp. It becomes for the time being an organ of secretion, purulent or serous fluid being thrown out from its surface. Supposing this abnormal condition to be established, the presence of pain is not a necessary consequence, and it is important that this fact should be kept in view, for if the tooth is permanently filled, while the discharge from the pulp continues, the tooth may have to be sacrificed. The phosphatic odour being present is the best guide in the matter.

2nd result is the formation of an ulcer, painful and irritable on the surface.

3rd result, granulation of the pulp, which may end in polypus of the pulp.

There are also other results—viz., the disappearance of the pulp altogether without pain — fatty degeneration; formation of secondary dentine.

TREATMENT.—The same general principles must be attended to as laid down in the acute form. Remedial measures offer very little prospect of success if the disease has advanced

beyond the pulp. The pulp, if only diseased, can be treated with arsenic and removed; or if there is a chance of secondary dentine forming, treat the discharging pulp with camphorated spirits of wine on wool, or carbolic acid and thymol. When the discharge has stopped fill with temporary stopping.

Diseases of the pulp as classified by Salter—1. Intrinsic calcification. 2. Suppuration and sphacelus. 3. Necrosis. 4. Polypus. 5. Sensitive sprouting.

Periostitis.

GENERAL PERIOSTITIS.—*Causes.*—By the inhalation of phosphorus fumes causing phosphorus necrosis; mechanical injury; exanthemata, scrofula, syphilis, and the effects of mercury and rheumatism.

SYMPTOMS—Pain, which is aggravated at night; heat of part, with swelling of face; constitutional disturbance; tendency to suppuration and necrosis. In general inflammation of the intra-alveolar periosteum, the symptoms are first found in the teeth. At first a disposition to grind them together, which for the moment gives relief, but in course of time the

least pressure is painful. This is succeeded by aching when the temperature is altered by hot or cold fluids. Each tooth feels lengthened and loosened, and too painful for mastication. On examination the disease will be found to have extended from the inner to the outer covering of the sockets and to the gum, the latter being of a dark colour, and thickened and vascular, with the free edge more coloured than the surrounding parts. On account of the membrane of the socket being thickened, each tooth can be moved with the finger. It is only in some cases that suppuration sets in.

TREATMENT.—Local depletion by leeches; incision through periosteum to give exit to effusion; poppy fomentation. If mouth is offensive, zinci chlor. gr. viii. or x. to ℥i. of water.

LOCAL PERIOSTITIS.—Acute and chronic. *Acute periostitis*, when confined to the alveoli of one or two teeth, occurs generally through disease in the tooth or teeth. Common causes are inflammation and suppuration of pulp.

SYMPTOMS.—Slight uneasiness and tension, pressure at first giving relief; the uneasiness is followed by a dull, heavy pain, and tooth feels longer than its fellows. At last the tooth is too

painful to be pressed upon, gum swollen and tender opposite fangs of tooth. Often before the gums are generally affected the free edge assumes a deep red colour, and forms a ring round the tooth; this is an early symptom, but is lost in the general inflammation, when pain is more severe, and periosteum separated from cementum; separation commences at, and extends from foramen in the root of the tooth. In the interval pus is formed, thus constituting an alveolar abscess.

In the chronic form the symptoms are less severe. Often caused by tartar, &c.

TREATMENT.—Leech to gum; aperient often good. Iodine and aconite good. Cleanse pulp canal. In suppuration with affection of the gum, better to extract the tooth. If it is due to rheumatism, do not extract tooth in simple case, but do so in syphilis and struma.

Alveolar Abscess.

CAUSES.—Inflammation of pulp; periostitis; mechanical injury producing loosening; fracture of tooth.

According to Mr. Salter, the matter of an alveolar abscess either bursts at the edge of the

gum, or through the gum itself, corresponding to the end of the root; or it may burrow outwardly to the surface of the face, on account of a preternaturally long fang, or from the abscess sac burrowing deeply, or the reflection of the mucous membrane from the gum to the cheek being superficial.

The fang at its extremity has deposited around it organisable lymph, which is converted into a sac or cyst, and hollows out a little cavity for itself in the bone. Pus is formed in the centre of the sac, and bathes the end of root. The development is generally accompanied by a deep-seated throbbing pain, and swelling of the face. When the abscess is about to point externally the integument becomes glued down to the bone around the spot where the matter ultimately appears, the area around the spot is red, distended, and throbbing, the skin becomes thin and papery, and the epidermis scales off. The abscess bursts through a jagged opening, which soon changes into a small fistulous orifice, surrounded by a pouting circular lip of granulations that sink into a depression, surrounded by the adhesions which limit the pus-discharging canal. Sometimes the lip of granulations becomes elongated into a papilla, and is covered with cuticle, the apex

of the papilla having an orifice through which the matter pours. When once this papilla forms, it returns again and again after excision with the knife, until the tooth is extracted. Alveolar abscess rarely opens on the cheek when in connection with the first teeth. There is not so much swelling as in necrosed bone. The canal is single, short, distinct, and not foetid. Salter says that an alveolar abscess may become a serous cyst. When the abscess has burst the relief is immediate; the coats of the abscess embrace the socket from which it has been separated, although the separation is maintained.

TREATMENT.—Removal of filling from stopped tooth; or extract the tooth. If not advisable to extract, leech, hot fomentations, aperients. When matter has formed, open the abscess. Complete relief follows, and swelling subsides. Result is either continuous pus-discharging fistula, which may close, and burst out again and again, or in a few exceptional cases the disease ceases altogether, the offending tooth still remaining. In external pointing, tooth must be at once extracted; if it is broken, every particle must be removed; if there is decided thinning of the integument, a vertical

incision must be made between the cheek and jaws, even after the extraction of the tooth, and oiled lint introduced into the wound to prevent reunion.

Exostosis.

SYMPTOMS.—When the disease occurs in connection with caries, it is attended with thickening of the gums, which assume a deep dull colour, and a disposition to bleed when subject to friction, either from the tooth-brush or food.

When the crown of a tooth is free from disease, exostosis may not affect the condition of the gums. Sympathetic pain in the head, face, or neck may be, and often is, the only symptom. Sooner or later local symptoms may arise by which the offender can be recognised. The tooth will become tender on pressure, or sensitive to the effects of hot or cold fluids, or the gum may become absorbed, and leave exposed the neck of the tooth, which eventually becomes loose. These symptoms commonly appear only after the patient has undergone great suffering from supposed idiopathic neuralgia.

TREATMENT.—By Extraction. In no well-authenticated instance has the enlarged cemen-

tum become continuous with the bone of the socket.

Fracture of the Teeth.

Often if a lateral incisor be broken off, before or at the age of thirteen, and the root be immediately removed, the canine will come forward, and in a few years fill up the space; or if the accident occurs at a later period, in a mouth crowded with teeth, a similar result will follow. A like course can be followed when the lateral is large, and a small central has been injured.

Necrosis of the Teeth.

When a part or the whole of a tooth has lost its vitality the condition is expressed by the term necrosis. The tissues become discoloured, but are seldom softened. This discolouration is produced by the pulp losing its vitality when its vessels are filled with blood, the ultimate decomposition of the blood corpuscles, and the solution of their colouring matter in the fluids present. These permeate the dentine, and impart to it a permanent stain—deeper stain in young people than in old, on account of larger size of pulp in former.

For treating stain, bleaching agents can be used with variable success. Chloride of lime, chloride of soda, and oxalic acid are good. Wash the cavity out well with water, close canal at apex of fang by wool, introduce bleaching agent on wool, and seal up cavity for thirty minutes or an hour; afterwards well wash out the cavity. When a dead tooth remains firm for a length of time the dentine will be dead, and the cementum alive.

Necrosis may attack the cementum, leaving the dentine healthy; the tooth becomes loose, and the periosteum becomes detached from the cementum. The patient complains of intermittent pain excited by the application of hot or cold water, and very commonly pain exists on pressure between the tooth and the gum. The crown does not partake of the discolouration as when the pulp is dead.

Another form of partial necrosis is when one or two roots of a tooth become dead. Pain in mastication, as the rough dead tooth irritates periosteum.

TREATMENT.—If teeth cause much irritation, remove them.

Salter on Difficult Eruption of the Wisdom Teeth.

The upper third molar may incline backwards or outwards, nipping the mucous membrane ; in time the mouth is closed, producing ulceration. The removal at once gives relief.

Lower third molar more complicated through partial inclusion in the ramus ; from want of space surrounding structure becomes inflamed and may suppurate, the pus secretion appearing to be within the space of the crown, and the membrane covering it. Lower wisdom is often developed horizontally forward ; spasmodic action of the masseter often adding to the difficulty of treatment. The pus burrows in all directions ; and so long as tooth is covered with gum, pus will be secreted by it. For abnormally developed upper wisdom teeth, extract. In *lower*, in young people, when sufficient space may be gained, lance gum, or cut away the whole of overlying gum. In older people extract.

Irregularity in the Position of the Permanent Teeth.

Irregularity may be divided into two groups :
1st. Irregularity in the position of the crowns

while the roots at their terminal points hold the usual place ; 2nd. Irregularity both in the position of the crowns and roots.

The former generally admits of treatment, which does not necessarily involve the loss of either the misplaced or a neighbouring tooth ; while the latter cases do not admit of remedy, excepting by removal of the misplaced organ.

Projection of the Upper Incisors and Canines.

CAUSES.—Excessive development of the alveolar process of the anterior part of the jaw ; but the most common cause is the molar teeth being very short, and allowing the lower incisors to press unduly upon the inclined lingual surfaces of the upper teeth. Another cause is the tardy eruption of the molars, leaving the incisors to act for a time upon each other, or the lower incisors may be unusually long, &c., &c.

TREATMENT.—By metal plate to labial surface of the projecting teeth, and extending inwards below the edges of the teeth, so as to prevent the lower lip from pressing behind the upper teeth.

Previous to this extract the bicuspid. Pass a

band of Indian rubber round the head, having connected it with the plate. This must be used until the teeth are in position, and after that, at intervals for a great length of time, perhaps for twelve months.

Odontomes.

The name is applied to those masses of dental tissues which result from morbid conditions of the formative pulp. Professor Broca classifies odontomes according to the period at which they arise, dividing them into four groups :—

1. Those which arise before the development of the membrana eboris (odontomes embryoplastic).

2. Those which arise shortly before the formation of the cap of dentine (odontomes odontoplastic).

3. Those which arise during the formation of the crown of the tooth (odontomes coronaires).

4. Those which arise during the formation of the fang, after the eruption of the crown (odontomes radiculaires).

Those of the first class (odontomes embryoplastic) bear no resemblance to teeth, and fall

more within the province of the surgeon. They consist of structure identical with that of fibrous or fibro-plastic tumours. Broca says they are encysted.

Those of the second class are more important. At the date of their origin the dentine germ is commenced by a layer of odontoblasts more or less completed, the dentine as yet not being formed. When the pulp has become the seat of an irregular outgrowth a mass is produced containing dentine, and perhaps also enamel, the enamel organ having followed, as it tends to do, the wanderings of the dentine germ, but as yet no part of a tooth has been formed; the mass may be a confused heap of dental tissues, not bearing the most remote resemblance to a tooth. These irregularities in the form and size of the dentine pulp may, as development goes on, give place to a more normal process, so that we occasionally find at the bottom of a warty-looking, irregular mass tolerably normal fangs.

Those of the third class (odontomes coronnaires) are no longer shapeless masses, in which little or no resemblance to a tooth can be traced. As these originate after the commencement of calcification at a time when there is a cap of dentine over the pulp, this

crown is always to be found bearing a tolerably close resemblance to that of a normal tooth, however much the aspect of the whole mass may be altered by subsequent outgrowths of the pulp. This form is far more common than that of the second class.

Those of the fourth class (odontomes radiculaires) are very rare, only four or five cases having been recorded. In these cases the growth is due to hypertrophy of formative tooth pulp after the development of the tooth is nearly complete.

The third class (odontomes coronaires) is the most common.

Salter classifies odontomes as :—

Congenital—

Warty teeth ; (= 2 and 3 of Broca.)

Hernia of the fang ; (= 4 of Broca.)

Enamel nodules :

Secondary or induced—

Exostosis ;

Dentive excrescence.

The correct diagnosis of these odontomes is a matter of great importance, since an error may lead to a severe operation.

To distinguish these encysted fibrous tu-

mours from ordinary fibrous tumours is almost impossible; but the distinct limitation of such a tumour, with the absence of one or more teeth, might lead to a suspicion of its nature. An incision over it would show whether it were encysted or not. Whenever there is enlargement of the jaw, and teeth have never made their appearance, there is a strong probability of the tooth being at the bottom of the mischief; and if this be kept steadily in mind, many an operation may be avoided. These odontomes remain often for a length of time without causing mischief. Sooner or later, however, they generally set up inflammation in the surrounding parts, and profuse and prolonged suppuration ensues, leading to the inference that the bone is dead.

TREATMENT.—Remove the mass at once, which can generally be done through the mouth, without making any external incision. The removal of the mass will be followed by subsidence of all the symptoms, and the large cavity left in the bone will soon contract and fill up, leaving no permanent gap behind.

*Dentigerous Cysts.**

The term dentigerous cyst is limited in its application to cysts which arise in connection with developing teeth, or teeth which, though their development has been completed, are retained within the substance of the jaw. Dentigerous cysts sometimes contain a number of supernumerary teeth, but not always so. Often only one tooth is found, which commonly belongs to the permanent set, although there are cases recorded of cysts connected with the temporary teeth. Teeth which lie buried in the jaw do not by any means invariably give rise to irritation. But in a certain number of cases these retained teeth cause to be developed around them a cyst with bony walls. The cysts in these cases have generally consisted of a thick soft membrane, outside of which comes a bony shell, formed by the bone of the jaw expanded over the growth within it. This membrane in some instances becomes calcified, or it may become infiltrated by earthy salts without structural arrangement. The cyst is usually filled with a clear glairy fluid in the first instance; but not uncommonly it has become inflamed at

* See Tumours.

some period; its contents will then be pus, perhaps a yellowish fluid loaded with cholesteroline. When one of these cysts is situated in the upper jaw the antrum is frequently involved in the disease—often the cyst occupies the antrum.

Mode of Formation.

Mr. Salter says the cyst is lined by the enamel pulp, the pulp expanding and containing fluid. Tomes says: "There is no doubt that the teeth are the primary cause of the mischief. When the development of the enamel is completed, its outer surface becomes perfectly detached from the investing soft tissue, and a small amount of transparent fluid not uncommonly collects in the interval so formed." Tomes thinks this is the manner in which the cysts arise. "Fluid collects between the enamel and the tooth capsule. As the cyst enlarges the contiguous bone is removed to make room for it, fresh bone being concurrently deposited on the outside of the jaw. In the case of such a cyst lying in front of a tooth being cut, it is obliterated by the advancing tooth, or it bursts; but when situated deeply in the jaw, a cystic tumour may be the result.

Cysts often arise in connection with the fangs of normally erupted teeth, but are not generally termed dentigerous cysts."

DIAGNOSIS.—The recognition of dentigerous cysts in the earlier stages of their growth is very difficult, and they have often been mistaken for solid growths. As a rule, they grow slowly. The surface of the tumour is rounded, hard, and smooth; or it may be lobulated by the existence of several cysts. Most cases recorded have been found in persons under thirty years of age. See if there is an absence of one or more teeth, or the presence of a temporary tooth, where the approximate ones are prominent. The presence of the regular number of teeth does not, however, prove that the tumour is not in connection with supernumerary ones. Sometimes, however, a puncture is necessary for diagnosis. Where the cyst is very much expanded, fluctuation is present, and a parchment-like crackle is heard on pressure.

TREATMENT.—Open the cyst and extract the tooth. In most instances this can be done through the mouth without an external incision being made. Fill the cavity with lint; the bony walls will gradually sink down till the outline of the jaw is wholly restored. But

- in those cases where the bone has been excessively expanded, the cure can be accelerated by crushing in the yielding walls of the cyst.

EPITOME OF DIAGNOSIS.—Absence of particular tooth, sometimes, however, arising in connection with supernumerary, slow growth. Not much pain; walls of bone expanded; fluctuation and crackling sound under finger: escape of fluid on puncturing.

Diseases of the Antrum.

In the normal condition the antrum is lined by a thin mucous membrane, continuous through an orifice in the middle meatus with the mucous membrane of the nose. This delicate mucous membrane is attached to a thick dense periosteum covering the bone. The average-sized antrum is capable of holding 3ij.—3iij. of fluid. It is an air cavity communicating with the nasal fossæ. The teeth which most commonly come into close relationship with the floor of the antrum are the *canines*, *bicuspidæ*, *first and second molars*.

SUPPURATION in the antrum, sometimes termed *abscess*, is almost always traceable to the influence of diseased teeth. Not to be

wondered at, seeing that often the roots of the first and second molars pierce its bony floor, and are only covered by periosteum. Thus an alveolar abscess may perforate and burst into the antrum; an abscess connected with the centrals has been known to produce abscess of the antrum. Generally, when suppuration is excited by a root of a tooth the pus lies between the apex and the periosteum, the latter being lifted from the bone, and separating the pus from the true antral cavity; thus pus often fails to escape by the nasal opening. Suppuration may also arise from a violent blow; catarrhal or other inflammation; or the presence of a foreign body.

SYMPTOMS of Inflammation and Suppuration or Abscess.—The symptoms attendant on inflammation of the lining of the antrum are dull, deep-seated pain, œdema and tenderness of the cheek, and a varying amount of pyrexia. The teeth in simple inflammation, although somewhat lengthened, are seldom or never disturbed in position; but where a morbid growth, originating in the antrum, has progressed considerably, the teeth often become separated from one another, and are diverted from their natural

direction. Rigors sometimes precede suppuration.

When the antrum becomes distended by suppuration, the bone is often sensitive to the touch, and the teeth appear lengthened. As the accumulation of pus progresses, a swelling appears in the sulcus between the teeth and the cheek, from the canine back as far as the third molar. Sometimes the concavity of the palate becomes obliterated; and in extreme cases the eye-ball is displaced, with consequent derangement of vision, or even amaurosis. In most cases some little tenderness and swelling of the cheek, and fulness about the zygoma is noticed. In advanced cases an offensive discharge may flow from the nostril (the corresponding one), due to absorption of bone. Malignant growths seldom remain long confined to the antrum, but speedily extend from it into the surrounding parts.

TREATMENT.—Give free exit to the pent-up matter. The most useful and best course is to extract all the carious teeth on that side of the mouth, and if matter finds its way through the alveoli, enlarge the one through which it passes. The first molar is the best to extract. Wash out cavity with warm water. Daily use astrin-

gent and disinfectant lotions. Pot. permang. very good. If the mucous membrane does not assume a healthy condition, use zinc. sulph. in weak solution. In obstinate cases tinct. iodi to be used. The opening must be kept closed, lest food get in and excite fresh irritation. This can be done with soft wax.

CYSTIC DISEASE, with one or numerous cysts, arises from cystic degeneration, or dilatation of gland follicles of mucous membrane. Swelling of cheek, with parchment-like crackling of walls, as in suppuration, due to thinning and distension. A cyst may become ossified.

DENTIGEROUS CYST may occupy the cavity of the antrum.

OSSEOUS TUMOURS may grow from walls of antrum. They are hard, unyielding, and there is no pain on pressure.

Diseases of the Gums.

Inflammation of the Mouth.

STOMATITIS.—Inflammation of the mouth, far more common in early life than at later periods.

SIMPLE STOMATITIS appears as slightly ele-

vated, reddish, glistening patches, which may coalesce, so that the whole surface presents the character of inflammation. Is common in first dentition.

TREATMENT.—A dose of aperient medicine, and emollient mouth washes.

Chronic Inflammation of Gums.

SYMPTOMS.—Gums at first suffer, then dental periosteum and alveolus. Surface of gum becomes minutely nodulated, spaces between teeth become filled up with cheese-like substance, made up of cast off epithelium; papillæ abnormally prominent; substance of gum generally thickened.

If unchecked, purulent matter discharged between gums and necks of the teeth. Breath offensive. Alveolar processes become involved, being either increased in size or absorbed, periosteum detached from the roots, tartar, often covering fang, having been deposited.

Disease often from long-continued dyspepsia, syphilis, mercury, &c.

TREATMENT.—Remove all exciting causes; lance gums freely. Tinct. iodi. good for painting on gums; tannin rubbed into gums, &c.

THRUSH.—A disease of early infancy; at first indistinguishable from simple stomatitis.

Development of a fungus—*Oidium Albicans*, appearing as small white spots, about the size of a pin-head, upon the dorsal surface of tongue, palate, velum, interior of cheeks, and lips. The specks coalesce; the spots become larger, with a tendency to the formation of a false membrane. The crusts fall off in a few days, and again appear. By carefully removing the deposit the mucous membrane beneath will be found neither bleeding nor abraded, but merely redder than natural, thus characteristically differing from aphthæ. This disease is contagious.

CAUSES.—Certain ailments of digestive organs; consequent inflammation of mucous membrane of mouth, with an increased acidity of its secretions.

TREATMENT.—Cleanse mouth every time after child has taken food. Sulphate of soda.

; **APHTHOUS (FOLLICULAR) STOMATITIS** usually occurs during the period from the commencement of dentition till the third year. May be a sequela of measles, or an idiopathic affection.

In the first instance the individual inflamed

follicles may be seen as isolated red spots, but they quickly soften down and pass into small, round, sharp-edged ulcers. The ulcers are seldom or never single; often found about the frænum, in the sulcus, between the lips and the gums, or on the lower surface of the tongue. The disorder is very painful.

The ailment is usually preceded by more or less fever, restlessness, loss of appetite, relaxed condition of bowels, &c.

TREATMENT—Correct gastric and intestinal disorder. Locally, borax, chlorate of potash.

Ulcerative Stomatitis.

May occur in adults, but generally between the ages of five and ten years.

SYMPTOMS—Commencing at or near the gums, more frequently in the lower than in the upper jaw, and usually on one side only; it may spread until the whole mouth is full of ulcers. It begins in the front of the mouth, and only when severe reaches to the molar region. The edge of the gum becomes thickened and congested, often of a pimply appearance, and deep purple colour, bleeding on slightest touch. Ulceration speedily sets in in severe cases, and

lays bare the necks of the teeth. Mucous membrane, touching at times ulcerated parts, becomes also affected, so that a line of ulceration, corresponding to the position of the teeth, runs along the inside of the cheek. In fully-developed form the following is the characteristic ulcer: The surface covered over with a dirty white or yellow material, which, on removal, leaves exposed numerous scarlet points on a yellowish ground. Edges of ulcer sharp and ragged; ulcer at first superficial, and becoming deeper. Trivial causes will set up the disease where there is any predisposing tendency—a carious tooth, or an abrasion, &c.

TREATMENT.—Dr. West says pot. chlor. is a specific for the disease, and considers local applications of second importance. In a week or ten days cure generally complete. Pot. chlor. gr. iij., every four hours in water sweetened, is sufficient for a child of three years of age; five grains largest dose for a child four to nine years of age. Good food and aperient when needed. Arg. nit. applied to raw surfaces relieves. Sod. chlor. gr. v. to ʒi. for offensive odour. Syphilitic ulceration is distinguished from ulcerative stomatitis in being less tender. Pot. iod. good.

Gangrenous Stomatitis (Cancrum Oris).

SYMPTOMS.—First, thick swelling of the face, skin tense and shining, swelling hard, tense, and circumscribed, free from tenderness. In its centre is a blotchy-looking red spot. An ulcer corresponding to the spot outside appears inside the cheek. This ulcerates, not very sensitive, produces profuse salivation, and gives gangrenous odour. Soon there is an opening into the oral cavity; death generally in a week. A strange feature is the absence of pain and of great constitutional disturbance. Generally occurs between two and five years of age, and in debilitated subjects.

TREATMENT.—Freely use nitric acid (strongest) to ulcer at once. Support strength. Disinfectant washes.

Syphilis.

SYPHILIS is, for greater convenience of description and treatment, described as being either **PRIMARY**, **SECONDARY**, or **TERTIARY**.

PRIMARY SYPHILIS is a purely local affection, and consists generally of a *hard, indurated sore* or *chancre*, on that part of the body affected by the virus.

SECONDARY SYPHILIS is that stage of the disease in which the constitution becomes implicated.

The *lymphatic glands, skin, and mucous membrane* are the seat of inflammatory action, and exhibit characteristic eruptions and infiltration.

The special characteristic of an eruption on the skin is the peculiar copper-coloured tint which it assumes during its later stages. The special characteristic of the induration and ulceration of the mucous membrane in Secondary Syphilis is the *symmetrical* arrangement of the patches; this is most noticeable when it occurs on the palate, fauces, and tonsils.

TERTIARY SYPHILIS is distinguishable from the secondary stage by the ulceration in the mouth being *unsymmetrical*; by the bones and cartilages, especially of the face (and of these principally those in the nasal region) being destroyed; and by the general effect upon the patient's health.

SYPHILITIC AFFECTIONS OF HARD PALATE—Insidious—not easily detected—begin in nose. *Symptoms*: tenderness in median line; blood in nasal mucus; swelling in mouth; dirty yellow look on palate; perforation and discharge,

in those cases where the bone has been excessively expanded, the cure can be accelerated by crushing in the yielding walls of the cyst.

EPITOME OF DIAGNOSIS.—Absence of particular tooth, sometimes, however, arising in connection with supernumerary, slow growth. Not much pain; walls of bone expanded; fluctuation and crackling sound under finger: escape of fluid on puncturing.

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4. Irritation of dental nerves by causes not productive of visible local lesions.
5. Ulceration and inflammation of the mucous membrane and sub-mucous tissue.

1. Includes irritation; acute and chronic inflammation of pulp; pressure from confined matter in the pulp, and secondary dentine.

SYMPTOMS of irritation and chronic inflammation.—Pains rarely continuous, more neuralgic in their character, and generally absent at times of full vigour, such as after dinner, &c. Pain due to acute inflammation is of a violent throbbing character; it attacks suddenly, and after a short time leaves equally as suddenly, from consequent death of the pulp. The recumbent posture, or active exercise, aggravates the pain by increasing the vascular supply.

TREATMENT.—Vide Inflammation of pulp.

2. Includes periostitis; acute and chronic alveolar abscess; absorption and exostosis of fang.

SYMPTOMS.—Pain, dependent on inflammation of periosteum; not so violent as in acute inflammation of pulp, rarely absent, and much

less influenced by temporary condition of the patient; pain throbbing when passing to supuration, instead of previous dull aching pain.

With exit of pus pain is reduced.

Pain on percussion. Tooth raised in socket.

With exostosis the pain is not always at first localised in tooth, but it is more of a neuralgic character, felt in the face, head, or neck. As disease advances generally the pain becomes more local; the tooth gets tender and sensitive to change of temperature.

TREATMENT for alveolar periostitis.—Lancing, leeching, aconite and iodine, remove cause. For abscess the tooth has generally to be removed. For exostosis, extract.

3. GENERAL PERIOSTITIS OF JAW.

SYMPTOMS in rheumatic periostitis.—Pains widely spread along the jaw, seemingly out of all proportion to the local mischief, and such as is visible to the eye, capable of being brought on by change of temperature, damp, &c.

4. Under this head come malposition and retarded eruption of wisdom teeth; pressure due to want of space.

Pain due to wisdom teeth often referred to

bicuspidæ.—A common source of great pain is the pressure of a wisdom tooth on the second molar, this frequently producing exposure of the pulp.

TREATMENT.—Extraction. Cutting away gum over tooth.

5. Vide Stomatitis.

Tumours.

TUMOUR — (*Tumeo, to swell.*) *Definition:* A morbid growth in connection with any of the tissues of the body, consisting of an excessive, diseased, or unnatural development, receiving a supply of blood independent of the surrounding tissues. Tumours may, after attaining a certain size, remain stationary, they may retrograde and disappear, or they may go on increasing in size.

Though they have a special blood supply, there is no evidence of their having a direct nervous supply. Nerves may, however, be found passing through morbid growths.

TUMOURS are (according to Paget) examples of morbid growths or growing parts, which—

- 1st. Are isolated from the surrounding parts by distinct investing layers of tissue ;
or,

2ndly. Though continuous with the natural parts, are abruptly circumscribed in the greater part of their extent; or,

3rdly. Are formed of new materials, infiltrated, and growing in the interstices of natural parts.

The term **HYPERTROPHY** is applied to an increase in the amount of tissue, the organ or part retaining its original arrangement and form. The hypertrophy may be *simple*—an increase in the size of the elementary parts of the tissue, or *numerical*—an increase in the number of the elements.

Tumours are divided by Paget into two classes, simple and malignant.

Simple Tumours.

1. Fatty.
2. Fibrous.
3. Fibro-cellular.
4. Fibroid, or Recurrent Fibroid.
5. Cystic.
6. Glandular, or Adenoid.
7. Cartilaginous.
8. Myeloid.
9. Osseous.
10. Vascular.

Malignant Tumours.

11. Scirrhus Cancer.
12. Medullary Cancer.
13. Epithelial Cancer.
14. Colloid Cancer.
15. Melanotic Cancer.

They are classified by Green ("Pathology and Morbid Anatomy") according to their histological characters thus:—

Type of the Connective Tissues.

Type of embryonic connective tissue

	(3, 4, 8, and 15)	Sarcoma.
"	fibrous tissue . . . (2)	Fibroma.
"	mucous tissue . . . (4)	Myxoma.
"	adipose tissue . . . (1)	Lipoma.
"	cartilage . . . (7)	Enchondroma.
"	bone (9)	Osteoma.
"	lymph- atic tissue. } The Lympho- mata. }	{ Simple Lympho- mata. Lymphadenoma. Leukæmia.

Type of the Epithelial Tissues.

Papilloma.

Adenoma.

The Carcinomata . .	{	(11) Scirrhus.
		(12) Encephaloid.
		(14) Colloid.
		(13) Epithelioma.

Type of the Higher Tissues.

Type of muscle	Myoma.
„ nerve	Neuroma.
„ blood-vessels (10)	Angioma.

IN PRACTICE tumours resolve themselves into three classes, malignant, non-malignant (benign or simple), and semi-malignant, that is, a benign growth which after a time takes up a malignant action.

SIMPLE, NON-MALIGNANT, OR BENIGN TUMOURS.—*Characters:* (1) Similar in structure to one or more of the normal tissues of the body. (2) Do not, as a rule, affect the surrounding parts, except mechanically. (3) Are circumscribed or encapsuled generally. (4) Do not directly influence the patient's health. (5) Do not affect the adjacent lymphatics, nor recur when completely removed. (6) If they ulcerate the ulceration is limited.

MALIGNANT TUMOURS. — *Characters:* (1) Infiltration of surrounding structures. (2) Implication of neighbouring lymphatic glands. (3) Occurrence of similar growths in the internal organs. (4) Liability to recurrence after removal. (5) Unhealthy character of ulceration when it occurs—tendency to spread and

indisposition to heal. (6) General breaking down of the patient's health, known as the "Cancerous Cachexia." (7) In microscopical appearance they are *heterologous*, that is, they do not resemble any of the normal tissues of the body.

SEMI-MALIGNANT TUMOURS are those in which some of the characteristics of a malignant growth are present, while other symptoms are absent. Thus a *simple* or *benign growth* may recur, affect the lymphatics, endanger life, and so become semi-malignant.

General Character of Tumours.

FATTY TUMOUR. — LIPOMA.—Soft, movable, round, lobulated, encapsuled. *Consisting* of cells containing fluid fat. The nucleus being compressed against cell wall. The cells are united by connective tissue, which forms septa and capsule, upon which ramify blood vessels. It grows slowly, is not painful. *Situate* subcutaneously near neck or shoulder, but may occur anywhere. It is liable to shift its position.

TREATMENT.—Remove with knife, the tumour readily turning out.

FIBROUS TUMOUR.—FIBROMA.—Usually firm, dense, and fibrous, movable, lobulated, encapsuled, painless, grows slowly and frequently to great size. *Consists* of fibrous tissue closely interlaced, having no definite arrangement; of cells, connective tissue corpuscles, which branch and communicate; usually but few blood vessels. The more rapid the growth the more numerous are the cells, and vice versâ. *Situate* in parotid region, antrum and uterus.

TREATMENT.—Removal when admissible. Have little tendency to recur.

FIBRO-CELLULAR T.—Soft, elastic, painless mass; grows quickly. Composed of areolar tissue; bands of firm white fibres intersecting a yellow sero-plastic fluid; abundant nuclei; and a thin capsule.

Appears on Scrotum, labia nymphae. Nearly all the softer kinds of polypi of nose, ear, &c., are of this structure; also the various cutaneous outgrowths, warts, &c. Heath describes this form of tumour in connection with the jaws as osteo-sarcoma.

FIBRO-PLASTIC T.—RECURRENT FIBROID T.—SARCOMA.—The tumours which are included in this classification consist of an immature con-

nective tissue in a state of rapid development; and according to the size, form, and degree of development of the masses of bioplasm are the different varieties distinguished—*round cells, fusiform or spindle-shaped cells, myeloid cells*. They grow rapidly; often become encapsuled; have a great tendency to infiltrate surrounding structures (but rarely infect the lymphatic glands) and to recur after removal. The softer and more vascular the tumour, and the more imperfectly developed the cellular elements are, the greater is its malignancy. The myeloid variety is least likely to recur.

They arise from the connective tissue of organs, the periosteum or medullary tissue of bones; frequently appearing about the jaws, parotid, and mammary gland. Epulis may be of the fibrous, fibro-plastic, or myeloid variety of sarcoma.

CYSTS OR CYSTIC TUMOURS.—Definition.—A cavity having contents which may be fluid, semi-solid, or solid, separated from the surrounding structures by a capsule which is more or less distinct.

THE STRUCTURE of the cyst wall or capsule will depend upon whether it is a new formation or a pre-existing tissue. In the

former case it will be a fibrous capsule, which may be distinct from, firmly connected with, or part of, the surrounding tissues, rarely possessing an epithelial lining. In the latter case it will have a lining of epithelium of the same character as that existing in the structure in which the cyst has originated, and in some forms the contents will be secreted by the cells of the lining membrane, as is probably the case in a dentigerous cyst.

A cyst may be attacked by inflammation and suppuration, which may lead to obliteration of the cavity, or to a troublesome sinus. The wall of a cyst may become calcified.

CYSTS OR CYSTIC TUMOURS are, according to Paget—

1. Simple or barren.—Serous, Sanguineous, Synovial, Mucous.

2. Compound or proliferous.—Frequently contain organized growths—such is a dentigerous cyst.

By Dr. Green they are classified according to their mode of origin :—

I. *Cysts* formed by the accumulation of substances within the cavities of pre-existing structures.

A. Retention cysts resulting from retention of normal secretions. These include—

- a. Sebaceous cysts.
- b. Mucous cysts.
- c. Cysts from retention of secretion in other parts, including ranula, from occlusion of salivary ducts; encysted hydrocele; cysts in mammary gland; some ovarian cysts, and simple cysts of liver and kidneys.

B. Exudation cysts, resulting from excessive secretion in cavities unprovided with an excretory duct—bursæ, ganglia, hydrocele, &c.

c. Extravasation cysts—Hæmatocele.

II. Cysts of independent origin.

A. Cysts from softening of tissues—cystic-sarcoma, cystic-lipoma, &c.

B. Cysts from expansion and fusion of spaces in connective (and cancellated) tissue.

C. Cysts formed around foreign bodies—extravasated blood and parasites.

D. Congenital cysts.

Any morbid growth may be complicated by cystic degeneration, and this condition is indicated by the prefix cyst, as cystic-sarcoma, cystic-carcinoma.

No parallel can be drawn between Paget's and Green's classification.

DIAGNOSIS.—In a cyst having fluid contents the feeling of fluctuation can generally be detected, but this may be masked by extreme tension of the cyst, or the thickness of its walls. Heath says, "When a cyst is sufficiently expanded for the wall to yield under the finger with the characteristic parchment-like crackle, there can be no difficulty in its recognition; but without this it is impossible in all cases to distinguish between a cyst and a slow growing tumour." Where any doubt exists the growth should be punctured with a trocar and canula, or an exploring needle. Heath says, "In the cases of cysts, whether uni- or multi-locular, the disease is of slow growth, and there is no tendency to fungous excrescences, so that the patient suffers little inconvenience. In the cystic-sarcomatous growths, on the contrary, the progress is comparatively rapid, and the patient is soon worn out with pain and discomfort."

TREATMENT.—In the case of a simple cyst, evacuate its contents and cause the obliteration of the cavity by pressure, by inducing supuration by a seton or drainage tube, injecting

with iodine, or removing portion of wall. If this treatment fail, the growth may be dissected out if admissible. Compound or multilocular cysts, in the early stage, admit of similar treatment, taking care to break down all the septa, so as to expose each cavity. When advanced, the whole of the affected bone or structure must be removed.

GLANDULAR T.—ADENOMA.—Firm, movable, circumscribed, lobulated, painless; consisting of hypertrophied gland structure; small sacculi, filled with glandular (spheroidal) epithelium grouped together by connective tissue.

The tumour may be superficial or deeply-seated in the gland, from which it is usually separated by a capsule.

They are most common in the mammæ, salivary glands, lip, &c. When they occur in the glands of the skin or mucous membrane they occasionally contain epithelium (squamous), and thus simulate epithelioma.

They may disappear spontaneously, or undergo fatty or inflammatory degeneration.

TREATMENT.—Friction with iodine; pressure; iodide of potass; extirpation.

CARTILAGINOUS T.—ENCHONDROMA.—May be

as soft as jelly, or as firm as ordinary cartilage. In the former variety it frequently grows rapidly, and to a large size, and has a malignant character; in the latter it grows slowly, is of moderate size, and painless.

Consists of a basis or intercellular substance which may be mucoid, hyaline, or fibrous; of cells containing one or more nuclei; and, usually, of a fibrous capsule, from which its further growth takes place.

Usually situate on or within the bones, particularly those of the hand, rarely in connection with the jaws; in the glands, especially the parotid.

Ossification and fatty degeneration are common changes.

OSSEOUS T.—OSTEOMA—EXOSTOSIS.—Osseous tumours may be formed of compact tissue. *Ivory Exostosis*—or cancellated tissue—*cancellated exostosis*. They are hard, firm, painless, of slow growth, often pedunculated.

The *ivory* form is of compact structure, with radiating fibres and Haversian systems. Grows from the bones of cranium, within the orbit, from jaws, especially the angle of lower jaw.

The *cancellated*, usually primarily enchondromatous, may arise in connection with any

bone; it usually grows more rapidly and to a greater size than the ivory form. In structure it resembles cancellated bone.

When an osteal tumour is found on bone it is covered with periosteum, when in soft tissues it is enveloped in a capsule.

HYPEROSTOSIS of the maxillary and other bones is a rare disease, and "consists in an interstitial growth and alteration, affecting the whole substance of the bone, and not merely its surface." (Tomes).

VASCULAR T.—ANGIOMA.—Consists of tortuous and dilated blood-vessels, held together by a small amount of connective tissue, and, according to the nature of the vessels, the growth may be of the *arterial*, *venous*, or *capillary* form. The tumour is soft; compressible, rapidly regaining its previous form on removal of the pressure; of a dark purple or scarlet colour, according to the arterial or venous character. The vessels are usually of natural size before they enter the growth.

The *capillary* form of nævus is the most common; it is often congenital, and frequently tends to increase.

Vascular tumours affect the gums, tongue, lips, &c.

When upon the gums, Mr. Salter says "the bone at the base of these growths appears always to be very vascular and open in texture." Hæmorrhage is liable to occur.

TREATMENT.—By ligature; vaccination may be performed on a small nævus; removal by the knife.

PAPILLARY T.—PAPILLOMA.—Papillary tumours consist of hypertrophied papillæ of blood-vessels, which are often dilated and tortuous, (each papillæ containing a vascular loop), supported by connective tissue, and covered with epithelium. They grow slowly and do not attain a large size.

Those papillomata growing from the skin are firm, and have a dense epithelial covering; while those of the mucous membranes are softer, more vascular, have a less dense epithelial covering, and a tendency to ulceration and hæmorrhage.

Sometimes they occur where no papillæ exist, as in the larynx. This disease is rare in connection with the jaws. Mr. Salter describes these growths as "warty tumours."

Microscopically, papilloma is distinguished from epithelioma by the epithelium being upon the surface of the papillæ, while in epithelioma

the epithelial elements are met with in the subjacent connective tissue, also in "globular nests."

TREATMENT.—Caustics; ligature; removal by the knife.

MALIGNANT T.—CANCERS.—CARCINOMATA.—In structure resemble one another, they all consisting of cells with nuclei and nucleoli, of an epithelial type, of a turbid fluid—*cancer-juice*—contained in a fibrous stroma, which is mainly a new formation. The blood-vessels, which are numerous, are limited to this stroma, and do not pass into the alveoli, thus distinguishing the cancers from the sarcomata, where the blood-vessels come into contact with the cells. Lymphatics have been shown to pass into the alveoli, and, therefore, become readily affected. They are very rarely encapsuled.

SCIRRHUS OR HARD C. rarely attains a large size; is dense, due to the large amount of stroma (fibrous tissue); grows slowly; depressed in the centre, with puckering of surrounding integument—consequently, when situate on the walls of a canal, contraction of its calibre; usually ulcerated; generally painful, pain at times lancinating.

Appears in mammæ, alimentary canal, tongue; rarely affects jaws. Not frequent before the age of forty. Average duration four years.

MEDULLARY, ENCEPHALOID, SOFT, OR ACUTE C. differs from scirrhus in the small amount of fibrous tissue, the abundance of cells, which rapidly undergo fatty degeneration; its softness; greater vascularity, and rapid growth. It has a great tendency to fungate.

Frequently affects the jaws and their appendages; the eyes and nares. In the early stage may be mistaken for nasal polypus. Average duration two years.

EPITHELIAL C.—EPITHELIOMA always grows in connection with a cutaneous or mucous surface, and the cells resemble those of the squamous epithelium.

It may begin as a hypertrophy of the epithelium, or epidermis, with desquamation—as a wart,—and as such it may remain stationary for years, or as a small foul ulcer with indurated edges. When it commences to ulcerate its course is one of constant progress; the adjacent tissues become infiltrated, the lymphatics implicated, it becomes heterologous by ex-

tending into adjacent connective tissue, bone, &c.

There may be much or little stroma, and the arrangement of this is characteristic in the formation of "globular nests"—an accumulation of cells in concentric groups surrounded with fibrous tissue. The epithelial elements are heterologous — being found in the connective tissue. The cut surface yields on pressure a turbid fluid, and often a worm-like curdy material resembling that from a sebaceous duct.

It is most frequently met with in the lower lip, on the tongue; also on gums, eyelids, cheeks, and œsophagus.

It is generally occasioned by some long-continued irritation.

SYNOPSIS OF TUMOURS as they affect the mouth and jaws. Almost every kind of tumour may be found in these regions, the order of frequency being

SARCOMATA	{	Fibrous.
		Fibro-cellular.
		Fibro-plastic.
CARCINOMATA	{	Encephaloid.
		Epithelioma.
		Scirrhus.
OSSEOUS.		
CYSTIC.		

Dislocation of Lower Jaw.

This is said to be more frequent in women than in men, and in middle age.

The *causes* of dislocation are opening the mouth too widely; violence; spasmodic action of depressor muscles. It may happen during the extraction of a tooth, taking an impression, or laryngoscopic examination.

The dislocation may be unilateral when one condyle is displaced, or bilateral or complete when there is displacement of both condyles. The latter is the more frequent of the two forms.

When the mouth is but slightly opened the condyles remain in the glenoid cavities. When the mouth opens widely the condyles glide forward upon the eminentia articularis, carrying with them the interarticular cartilages. In dislocation the condyle slips forward into the zygomatic fossa, the capsular ligament is stretched, but not ruptured; neither are any of the other ligaments. The interarticular cartilage is attached to, and follows the movement of the condyle.

SYMPTOMS.—In complete **BILATERAL** luxation the mouth is open, and the teeth are carried unduly forward, the jaw is fixed, a distinct

hollow is seen in front of the ear, and the condyle may be felt anterior to the middle root of the zygoma; there is dribbling of saliva, speech and deglutition are impaired.

In **UNILATERAL** dislocation the above symptoms are less marked, but the hollow in front of the ear corresponding to the luxation is the surest sign. The chin may be directed to the opposite side.

REDUCTION of dislocation is most simply effected by the operator protecting his thumbs with a napkin, placing them upon the molar teeth and grasping the chin with his fingers. The jaw is then pressed downwards and backwards and the chin elevated at the same time. The reduction is more readily effected by first replacing one condyle and then the other. A bandage should be worn for a week or two afterwards.

Fracture of Lower Jaw.

Fractures of this bone are almost always compound, more frequently from laceration of the gum, which adheres closely to the bone, and is very inelastic, than from an external wound; they are very often comminuted. Fracture occurs most frequently in the body, in the

region of canine or mental foramen, and is usually oblique from before backwards. Fracture at the symphysis is uncommon, and it is usually vertical. Fracture may occur through the neck of one or both condyles; the coronoid process may also be broken off obliquely.

The *signs* of fracture are irregularity of teeth (if through body), mobility of fragments, crepitus, increased secretion of saliva. The nature of the displacement will depend upon the action of the muscles attached to the fractured bone.

TREATMENT.—Reduction of fracture; if comminuted, allow pieces to remain, together with loose teeth. Maintain the parts in apposition by suitable apparatus for four or five weeks. A gutta percha splint and four-tailed bandage commonly suffice.

In severe cases of double fracture an intra-dental splint, fitted upon the teeth, is most satisfactory.

Closure of the Jaws.

CAUSES.—*Spasmodic* action of masseter and internal pterygoid, due to difficult eruption of wisdom teeth; exposure of nerve of a (molar) tooth, &c.

Permanent closure of jaws from cicatrices,

the result of sloughing of the cheek, necrosis of alveolar processes ; osseous union between the upper and lower jaws ; ankylosis of temporo-maxillary articulation, which may be traumatic or idiopathic, and that fibrous or osseous. The presence of a tumour, especially in parotid region.

TREATMENT.—In the spasmodic form of the disease at once remove the cause, when relief is frequently immediate.

The permanent form is amenable to two methods of treatment: the division of the cicatrices or bands of union, and the persistent wearing of shields for many months to prevent contraction ; and the formation of an artificial joint in *front* of the cicatrix by removing a V shaped piece of the jaw, fibrous union taking place between the divided bone (Esmarch's operation).

Where fibrous ankylosis of the joint exists, it must be broken down by forcibly separating the jaws.

Necrosis of the Jaws.

The immediate cause of necrosis is periostitis resulting in purulent effusion between the bone and the periosteum ; and in a large ma-

jority of cases more remote cause can be traced out.

SYMPTOMS.—At first indistinguishable from inflammation of the alveolar periosteum, but differ as disease advances. Instead of the formation of a local and circumscribed swelling, the gum over the diseased bone becomes generally thickened and tumid, and of a deep red colour; pus oozes up from the edge of the gum. After a time the gum separates from the alveolus, the margins of which become exposed. Teeth fall out. In a few weeks the dead alveoli are detached from the subjacent living bone, and lie loose in the substance of the thickened gum, bathed in pus. If the pus does not find an exit into the mouth it often points below the chin, sometimes beneath the fascia in the neck, at times reaching as low as the clavicle. In the upper jaw it generally finds its way into the mouth.

Phosphorus Necrosis.

The poison is supposed to act locally, and as it cannot attack an unbroken surface, it usually gains access to the bone through the socket of an extracted tooth, or through the

cavity of a carious tooth. *Mr. Salter says it gains access through the exposure of the pulp.*

SYMPTOMS.—The swelling of the soft part is great and the integument becomes red and shining. The suppuration, which may give rise to external fistulous openings, is generally discharged into the mouth; the advent of suppuration is preceded by rigors and pyrexia, and in severe cases by delirium. After it is fully established the severity of the constitutional symptoms abates, though the patient's health suffers very greatly from inability to take solid food, from swallowing decomposing pus, and from exhaustion. It may be complicated with gangrene or erysipelas.

The bony deposit thrown out is peculiar in appearance, and like pumice-stone. *Salter says there is no tendency to extension of the disease; the whole region is attacked at once.*

The separation of the sequestrum often takes a year or more; it must on no account be removed before it is detached.

Support the patient's strength, syringe out with Condy, &c.

Exanthematous Necrosis.

(**ERUPTIVE N.**)—After eruptive fevers, particularly after scarlet fever, portions of the alve-

olar borders of the jaws, very commonly including the developing permanent teeth, are found to exfoliate. The course is not usually violent. The disease is remarkably symmetrical, affecting the two sides of the mouth alike. Most frequently occurs between the ages of five and six years.

TREATMENT is much the same for every form of necrosis. While in the stage of periostitis threatening necrosis, free incisions through the inflamed gums, and poppy-head fomentations used freely. Teeth or stumps causing irritation must at once be removed. The dead bone in all cases is detached from the living by absorption of the layer of living tissue which connects the two. Zinc. chlor. gr. v. to ʒi. to keep mouth in healthy action during the time of exfoliation.

HARE-LIP.—A congenital fissure of upper lip, the result of an arrest of development which takes place at the outer border of the premaxillary bone, and is usually associated with some amount of disunion or malformation at the premaxillary suture, giving rise to a gap in the alveolus. When the arrest of development takes place on one side the hare-

lip is **SINGLE**, when on both sides it is **DOUBLE**. There is no authentic record of median fissure.

When the hare-lip is double, there is very frequently cleft palate, with deformity of premaxillary bones.

OPERATION.—The age for this is considered best at from the sixth week to third month.

First detach the **freemum** and all membranous connections between the gum and lip.

Pare the edges of fissure by transfixing at upper angle and cutting downwards, turning the knife inwards near the free edge of the lip. This is done on both sides, and the paring finally detached at the upper angle.

The hare-lip pins are inserted deeply, taking care not to pierce the mucous membrane; the lower being inserted first so as to transfix the coronary artery, which has been divided, and to bring the lower edges on a level.

A twisted suture is then applied, care being taken to prevent puckering in the line of union.

In **DOUBLE** hare-lip the operation is carried out on the same principles, with the additional treatment of the intermaxillary portion. This will depend upon the nature of the deformity.

If it be large and projecting, it should be bent or broken back by forceps.

The pins should be removed about the fifth day.

CLEFT PALATE.—The various parts constituting the hard and soft palates may be fissured separately, or the fissure may extend right through from before backwards, and be combined with hare-lip.

STAPHYLORAPHY may be done successfully on young children. As performed by Ferguson, the operation consists of four parts—(1) divide the levator palati by passing a curved knife through the fissure behind the velum. The posterior pillar of the fauces (palatopharyngeous), being put on the stretch, is also divided. The anterior pillars (palate-glossus) may be divided also.

(2.) The edges of the fissure are then pared from behind forwards, first by seizing the lower end of the uvula, putting it on the stretch, and cutting first one side and then the other, removing the angle of union, in front, at last. The bleeding should be stopped by gargling with cold water, after which (3) the sutures are introduced to *hold* the parts toge-

ther, which have been relaxed by the division of the muscles.

The sutures may be passed in the following manner:—A single thread is passed through the left side of the cleft; a double thread through the right side, into the loop of this the single thread is passed and then the loop is withdrawn, carrying with it the single thread which is thus brought through both sides of the cleft. The single ligature is next tied. Several stitches may be introduced.

(4.) If no irritation be set up, the stitches may remain for a week. It is better to remove them at intervals.

To obtain closure of a fissure in hard palate, Sir William Fergusson perforates the hard palate and opens up a cleft right into the nares on each side of the gap in the median line, the opening being made parallel with the margin of the original space. The continuity of bone structure then being broken, the margins of the central cleft can be brought into contact, and bony, or at least strong, fibrous union obtained, the small cleft at each side becoming filled up with granulations or new bone.

To attempt union of the soft parts only is rarely successful.

Diseases of Uvula and Tonsils.

ELONGATION OF UVULA, producing irritation of fauces and larynx, and a tickling or spasmodic cough.

TREATMENT.—Remove pendulous body by snipping it through the middle.

TONSILLITIS, CYNANCHE TONSILLARIS, QUINSEY, or acute inflammation of tonsil, known by redness and swelling of part; swelling under angle of jaw, furred tongue, difficult deglutition; increased secretion of saliva; fever; the voice thick and nasal.

TREATMENT.—Leeches to angle of jaw; scarify tonsil; fomentation.

In early stage Troch. Guaiaci very valuable; astringent gargles.

SIMPLE CHRONIC ENLARGEMENT OF THE TONSIL occurring in consequence of repeated attacks of inflammation, or a sequela to measles, scarlatina, &c.

In this condition the tonsil is red and congested; slight causes will set up acute inflammation, with ulceration or abscess.

CHRONIC INDOLENT ENLARGEMENT OF TONSIL differs from the former in the gland being

rather pale, hard, smooth, and semi-elastic. Generally develops in connection with struma, and without any assignable cause.

Enlargement of tonsils interferes with respiration, the mouth is habitually kept open, and, by tension of muscles of face it is said V shaped maxillæ result.

TREATMENT.—Tonics, iodine of iron, &c. Local application of astringents. Generally part of gland has to be removed. Blunt-pointed bistoury, the near half wrapped in lint to protect lips and tongue. Cut downwards and to median line, remembering relation of internal carotid, and ascending pharyngeal arteries. Guillotine may be used.

HÆMORRHAGE FROM TONSIL.—Iced water; Liq. Ferri Perchlor. Tie external carotid, ligature must be below ascending pharyngeal.

MALIGNANT DISEASE OF TONSIL is not frequently met with.

Diseases of Pharynx and Œsophagus.

POST-PHARYNGEAL ABSCESS may arise from diseased vertebræ, inflammation of connective tissue, struma, or direct injury. Forms in areolar tissue between vertebral column and

posterior wall of pharynx, which is pushed forward against posterior nares, producing alteration in voice, difficult deglutition ; or, if lower down, interfering with respiration, dyspnoea being greater in erect posture. There is fluctuation.

TREATMENT.—Open abscess into fauces.

NASAL POLYPI may extend into pharynx. When polypi arise from the wall of the pharynx they are generally malignant. Tumours in this region are mostly cancerous, and rapidly prove fatal. Epithelioma has also been found to affect this part.

ULCERATION OF OESOPHAGUS.—All diseases of oesophagus tend to constrict and finally occlude its passage. Ulceration may be simple, phagedænic, or syphilitic. Ulceration may perforate the walls, and, not unfrequently, extend into trachea.

SYMPTOMS.—Difficulty in swallowing—dysphagia,—sometimes deglutition is impossible and starvation occurs ; pain, with frequent sense of nausea.

TREATMENT.—Locally, solution of nitrate of silver ; spray inhalations. Constitutionally,

tonics, etc. Where starvation is imminent a gastric fistula may be made.

STRICTURE OF OESOPHAGUS.—A narrowing of the canal may be caused by

1. Spasmodic stricture.
2. Permanent stricture.
3. Pressure of an aneurism or tumour.
4. Dislocation of sternal end of clavicle backwards.

SPASMODIC STRICTURE is purely nervous, is witnessed in globus hystericus. It may also be due to anæmia, or slight inflammation of mucous membrane.

DIAGNOSED from permanent stricture by dysphagia being temporary; bougie is passed with little difficulty; symptoms aggravated when patient's attention is directed to them.

TREATMENT.—Antispasmodics.

PERMANENT OR ORGANIC STRICTURE may be fibrous, or cancerous.

FIBROUS usually results from swallowing some corrosive fluid, or boiling water, or from acute inflammation; seldom idiopathic.

SYMPTOMS.—Edema glottidis, and conse-

quent asphyxia liable to occur; constant difficulty of swallowing; bougie meets with obstruction.

TREATMENT.—After imbibing corrosive fluid *do not* use stomach-pump. Treat stricture with occasional passage of probang or bougie; weak solution of arg. nit., fluid food, enemata, gastrotomy.

CANCEROUS may result from the degeneration of the fibrous form.

SYMPTOMS.—Dysphagia. Instrument passes over rough surface; its removal is followed by expectoration of blood; enlargement of cervical glands; cancerous cachexia.

TREATMENT.—Palliative only.

Foreign bodies in Pharynx, Œsophagus. and Air-passages.

A foreign body, when fixed in pharynx or œsophagus, produces sense of choking, fits of coughing, and difficulty in swallowing solids.

TREATMENT.—When the body cannot be removed with the finger, curved forceps, or other instrument, an emetic may be given. If the body is one which will pass through in-

tæstinal canal it may be pushed into the stomach, and solid food given. If fixed, **ŒSOPHAGOTOMY** should be performed, thus: Incision along anterior border of left sterno-mastoid, retract or divide omo-hyoid, pass between carotid sheath and larynx, avoiding superior and inferior thyroid arteries and recurrent nerve. Cut down upon catheter passed into canal and near to foreign body; enlarge small opening with forceps to avoid hæmorrhage.

Foreign body in Larynx or Trachea.

The body may lodge in (a) ventricle, or in (b) rima glottidis; it may be loose in (c) trachea, or have passed into one of the (d) bronchi, usually the right, this one being larger, and its upper opening more in a line with the trachea than the left.

SYMPTOMS.—There is at once a violent spasmodic cough and dyspnœa. If in larynx the voice will be affected; if in trachea its movement will be heard by the stethoscope; if in bronchus the entrance of air will be impeded, and there will be diminution or absence of respiratory murmur. The foreign body may become lodged against the rima glottidis, and death rapidly follow.

TREATMENT.—If the body cannot be dislodged with the finger, and it is believed to be in the larynx, laryngotomy should be performed. If the body be in the trachea or bronchus, perform laryngotomy, then invert the patient. If not removed by these means, then tracheotomy, the former operation being no impediment.

LARYNGOTOMY.—A vertical incision about one inch in length, through the skin in the median line, over space between thyroid and cricoid cartilages; a horizontal incision through crico-thyroid membrane, avoiding the crico-thyroid artery.

TRACHEOTOMY.—Head thrown well back, incision, two inches in length, in middle line, from top of sternum. Skin, superficial and deep fasciæ, are thus divided, passing between the sterno-hyoid muscles, avoiding inferior (right, if there be two) thyroid vein, three or four rings of the trachea are opened. The isthmus of thyroid gland crosses the second and third rings. The arteria thyroidea ima (middle thyroid), when present, passes up in front of trachea.

Ulceration of the Tongue.

A very slight roughness of natural or artificial teeth will suffice to cause a superficial ulcer

in a person predisposed to such ulcerations; they are common amongst the dyspeptic; they come and go rapidly; have bright red edges; are shallow and sensitive.

TREATMENT.—Touch them with arg. nit.

ULCERS FROM RAGGED TEETH are exceedingly foul, surface shreddy, offensive discharge, sometimes deep in the substance of the tongue. They are not surrounded by the hard base characteristic of epithelioma or syphilis, although the surrounding tissue will, in a degree, be hardened by infiltration with inflammatory exudations. The inflammatory action may extend to the whole floor of the mouth, causing difficulty in speech.

DIAGNOSIS.—Rapid formation, inflammation, hard surface, and absence of a definite indurated margin. The existence of a roughened tooth will confirm the conclusion arrived at, although often a local cause may excite epithelioma or syphilitic ulceration.

Saliva and Salivary Calculus.

PAROTID GLAND is the most abundant source of saliva. Saliva from it differs from that obtained from other glands. When left to itself for

a few minutes it becomes turbid, from crystals of calc. carb. Saliva is constantly pouring out independently of the stimulus of food; contains much carbonate of lime, and is poor in phosphate of lime.

SUBMAXILLARY GLAND.—Saliva is viscid, so that on standing it sometimes becomes quite gelatinous; does not deposit calc. carb., though its reaction is alkaline. It flows in response to food only.

SUBLINGUAL GLAND pours out a viscid fluid rich in ptyalin, also alkaline. The mixed saliva deposits epithelial cells, mucous corpuscles, fat, vibriones, cryptogams, &c. It is alkaline.

TARTAR is composed, according to Berzelius, of—

Earthy phosphates	...	...	79.0
Salivary mucus	...	...	12.5
Ptyalin	...	...	1.0
Animal matter soluble in			
Hydrochloric acid	...	...	7.5

Tartar, according to Tomes, does not injure the teeth, but affects the alveoli and gums, robbing the teeth of their support.

On Lancing the Gums.

If symptoms are present which might arise in connection with the eruption of the teeth, and the gums are not pushed up by the advancing teeth, it is *useless* to lance.

Lance when the gums are prominent, and in a state of tension; divide the gum right down to the tooth. When there are nervous twitchings of the face, and convulsions, lance *immediately*. It is also of service to lance when depletion is needed, when the gums are painful and very swollen. This should be done by scarifying the surface only.



